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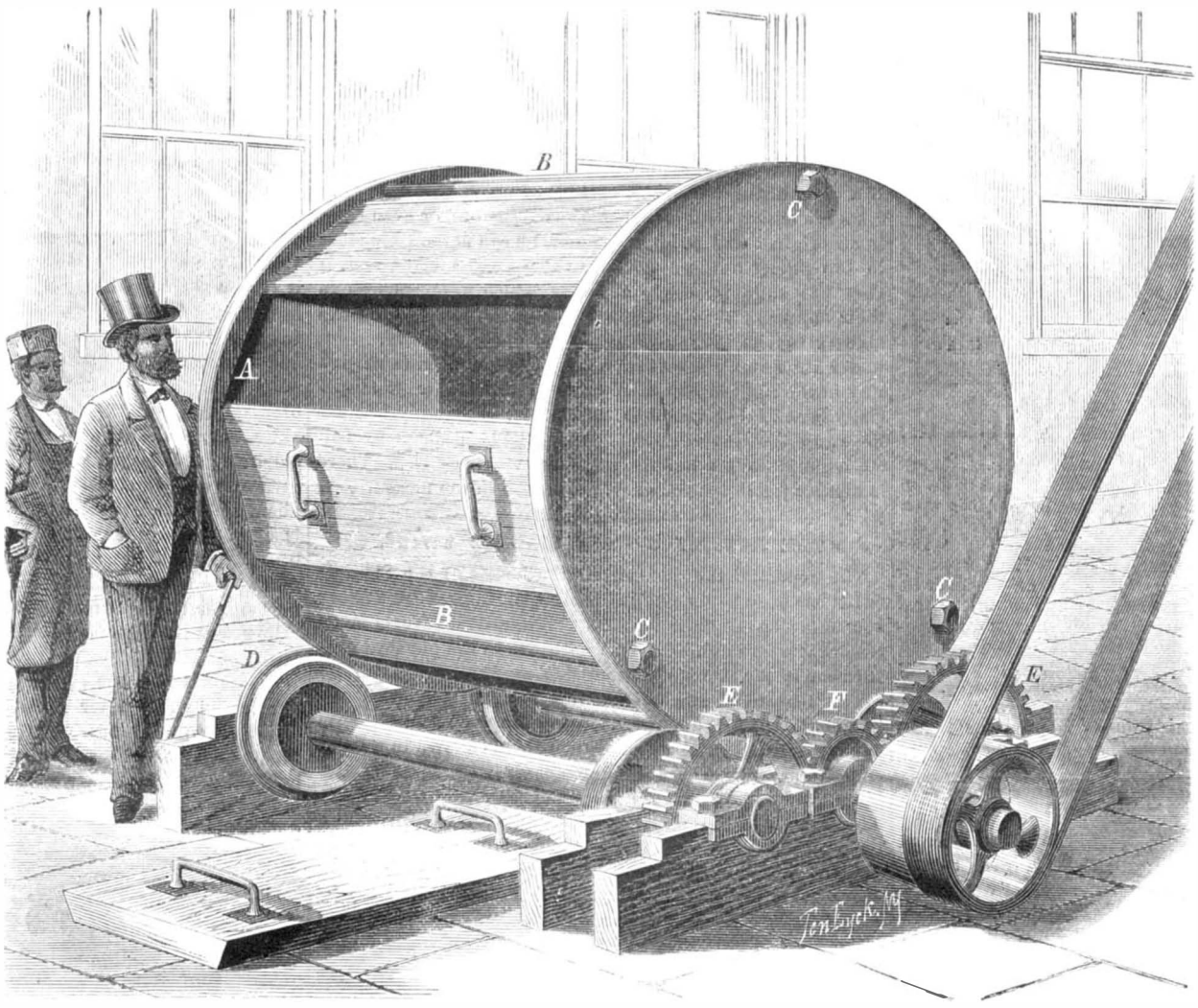
IMPROVED GRINDER FOR CASTINGS.

The invention herewith illustrated consists in a large cylindrical vessel rotated by improved mechanism, and adapted to hold quite large castings, stove plates, sinks, and hollow ware, for example, in order to give the same the requisite cleaning and polishing. The cylinder is made with two heavy wooden or metallic heads, and with a lagging of heavy plank or metal forming its sides, in the shape of a number of plane sections. Two or more of these sections are removable in order to admit of the introduction, into the interior of the receptacle, of castings regardless of size or form.

In our engraving one of the sections is shown detached and placed upon the floor. Through the opening thus left will be seen a flange, A, which runs around the circumferences of both cylinder heads. The sections to be removed are provided with suitable handles; and in order to detach them from the grinder, the bolts, B, are slacked up by unscrewing the nuts, C. The ends of the planes are then readily slipped from under the flanges, A, which, it will thus be seen, braces the sections against the outward pressure of the heavy contents of the machine. When the latter is filled, the covers are replaced, the nuts, C, tightened, and the various portions are at once firmly bound together. The sections are provided with suitably beveled edges in order to secure close joints, and those not intended to be removable are permanently secured in place.



MILLER'S IMPROVED GRINDER FOR CASTINGS.

The reader has doubtless already remarked that the mechanism for rotating the cylinders differs from that employed in the ordinary rumble. In the present case, the edges of the heads rest and revolve upon four flanged rollers, D. Upon the shafts of the latter, which have their bearings in heavy framework, are two gear wheels, E, which mesh with the pinion, F, which is on the same shaft as the driving pulley. It is obvious that the motion of the latter is imparted to the rollers and by these to the cylinder, the weight in the latter, of course, contributing to increase the traction between the surfaces.

The manufacturers inform us that they have had in use one of these machines, 5 feet in diameter by 5 feet in length, and find that it requires but few repairs, while doing its work with much efficiency. The apparatus has been in operation in their foundery since 1869, and three more have recently been added. From 500 to 1,000 pounds of bugs (small scraps of iron from the bottom of the cupola) are put in with the castings, the quantity varying with the size of the machines. The manufacturers also state, in order to show the small amount of power required to drive the apparatus, that they run three grinders, two full of castings and bugs (in dimensions about 2½ by 3 feet) and the other with facing, a 14 inch emery wheel, and a drill, with 100 feet of 2 inch shafting with a 1½ inch double belt traveling 600 feet per minute. This device is covered by two patents granted to George Miller, of Providence, R. I., and a third patent to the same inventor relates to the application of the plan to water wheels. The cylinder in this instance is the wheel, overshot or otherwise, from which power is transmitted to the friction rollers, and thence to the pulleys, in reverse direction, in short, to the hammer above described. The wheel thus arranged, it is claimed, admits of cheaper construction than when the centralshaft and the necessary arms for supporting thereon are used. The power also being communicated to the machinery from four different points, and these being those at which the wheel is supported, it is considered that the strain upon the latter will be more equally divided, and that twisting and cross strains will be avoided. The inventor also believes that the present arrangement will have advantage in point of lessening friction. Further particulars regarding the grinder may be obtained by addressing the Miller Iron Company, Providence, R. I.

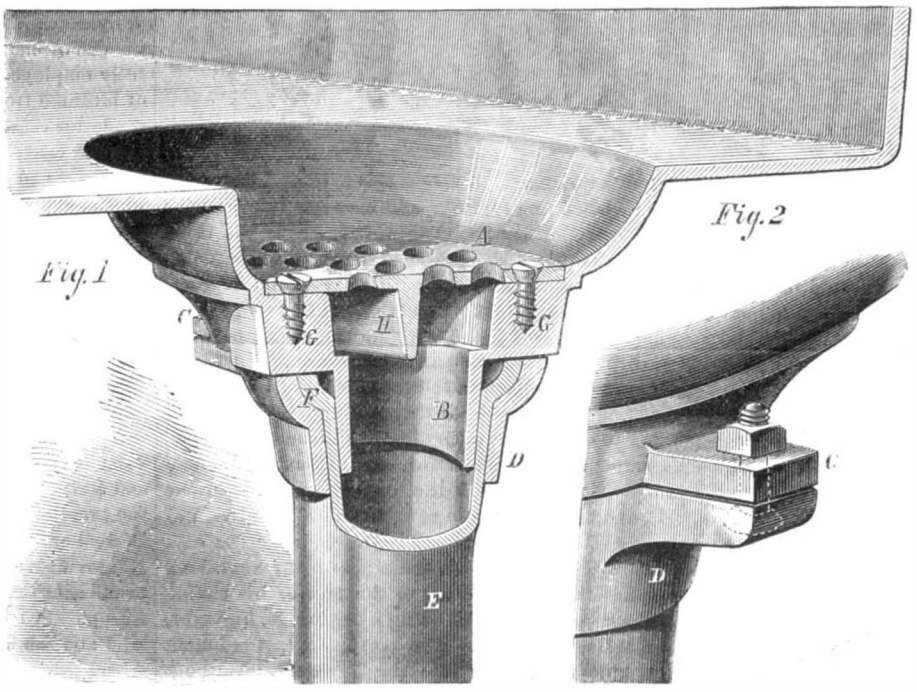
MILLER'S IMPROVED SINK.

A prominent objection to many forms of sink in common employment is that the strainer inside and the flange of the waste pipe outside are secured to the sink by screws which, passing directly through all portions, are set up by nuts. The disadvantage is, that two extra holes are thus made in the bottom of the sink, which require constant packing to render them watertight, which packing must be removed and re-adjusted whenever it becomes necessary to take the strainer out to be cleaned. If the joint be not perfectly tight, the water gradually escapes down through the bolt holes and causes an annoying leak.

To obviate this trouble, the invention represented in the annexed engraving is proposed. A is the strainer (Fig. 1), secured to the funnel in an annular space, as shown. The outlet or nozzle, B, to the funnel is cast to the sink's bottom, and on the thick portion of the latter are formed lugs, C. D is a gland, also provided with lugs, which enable it to be secured to lugs, C, outside the funnel, by a nut and bolt, as shown in Fig. 2. The space between the gland, D, and the nozzle, B, receives the soft metal waste pipe, E, the end of which is turned over as a flange into the enlarged upper portion, F. It will be observed that, instead of allowing the screws, G, which hold the strainer, A, to the funnel bottom, to pass clear through the latter, they merely enter into the thick portion, so that of course no water can escape by the means before referred to. These screws are made of brass to prevent them becoming rusted in their seats, and consequently are easily removable. A rib or truss, H, is constructed across the center of the under side of the strainer, to back up the thin metal of the latter against injuries, and to stiffen the casting in the operation of molding.

As a point of advantage claimed, it may be noted that the fastening of pipe to the nozzle is entirely independent of the attachments of the strainer. The latter, while being so bolted as to be quickly taken out when necessary, is, from the fact of its being thus secured, not liable to be lifted from its place by servants, in order to throw filth, crumbs, or matters likely to clog the pipes, down the sink.

Patented December 2, 1873, by Henry Miller. The manufacturers, who may be addressed for further information relative to sale of rights, etc., are the Miller Iron Company, Providence, R. I.



MILLER'S IMPROVED SINK.

Novel Way of Exporting Bone Dust.

The immense trade in Australian canned meats, now carried on, has had the effect of causing a great accumulation of bones in Melbourne, Australia, where the putting up is done. The sale of the bones is now growing into a remunerative branch of export trade as bone dust manure; and an Australian paper, speaking of the subject, gives an account of the manner of its exportation. It says that a recent vessel, bound for London, has on board a shipment of one hundred tuns of bone dust, prepared for exportation in an altogether novel manner, and one which promises to come into extensive use. To facilitate this trade, an apparatus has been contrived for compressing bone dust into half its original compass, reducing it at the same time into a form very convenient for shipment. By means of strong pressure the crushed bones are molded into cakes of six inches square and three inches thick, something like flooring tiles, each cake weighing a little over four pounds. These bone dust tiles are just adhesive enough to admit their being handled freely —thrown about like bricks, if necessary—and are yet firm; and when required for use, they can readily be crushed, or melted by the application of a little hot water. A tun weight of the manure measures 26 cubic feet, and contains 252 of the cakes. The manufacture of bone dust for fertilizing is a large and rapidly increasing industry in this country, and this Australian method might be profitably adopted here.

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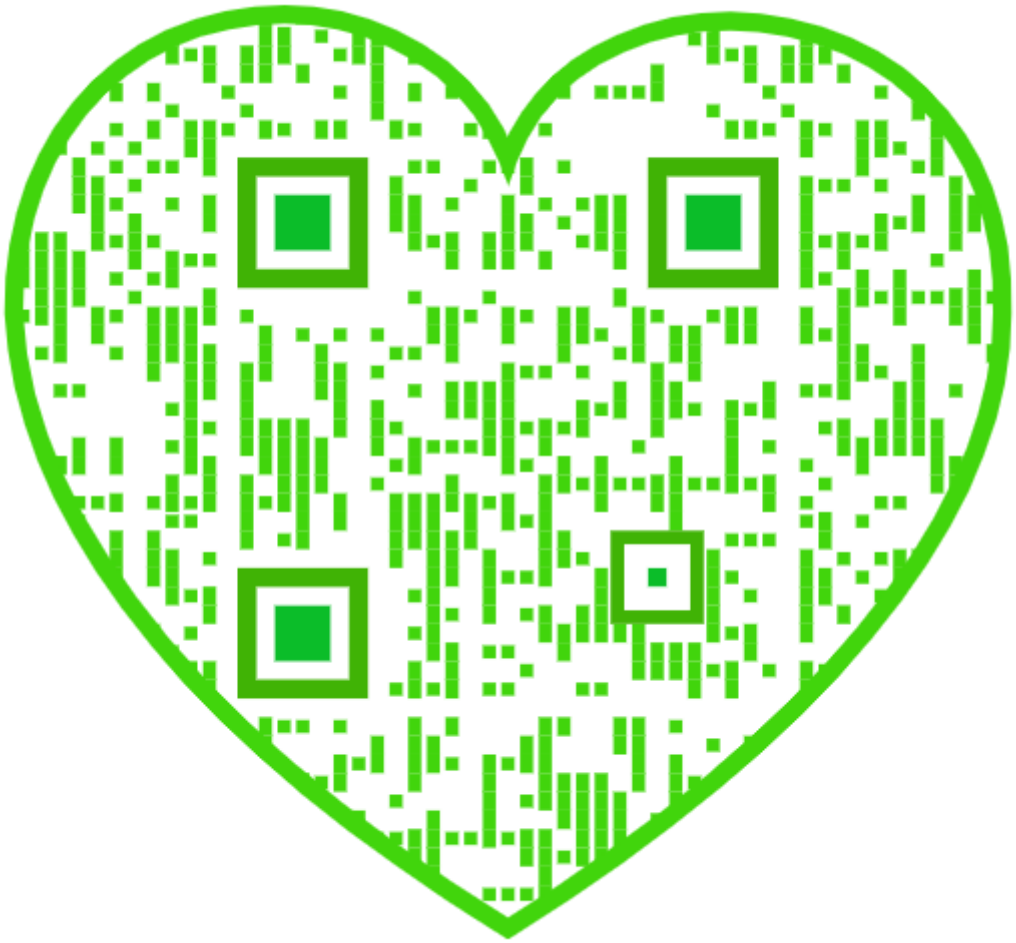

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PROPOSED LAW FOR CASTINGS.

Mr. Sumner has introduced the following bill (No. 119) into the Senate:

Be it enacted, etc. That no person shall counterfeit or make a facsimile of any metal casting, by using such casting as a pattern in molding, unless by the written consent of the owner or producer of the original pattern from which the casting was made; and any person who shall counterfeit or make a facsimile of any metal casting, either in whole or in part, by the means aforesaid, without the consent of the owner, shall be liable to such producer or owner of the original pattern in the amount of the ordinary wholesale profits upon the articles so produced, recoverable, with costs, by bill in equity, in any circuit court of the United States, and the court may restrain by injunction, and may order that all counterfeit metal patterns, and the metal products therefrom, shall be delivered to the complainant or be destroyed by the marshal, and may pass such further orders and decrees as may be meet in the premises.

"This has been read twice, ordered to be printed, and referred to the committee on patents. We hope it will rest there. The patent laws already provide in the most comprehensive manner for the protection of original work; and if Congress goes further still and attempts to establish an espionage over the details of every man's shop, the result can only be injurious to manufacturers of all kinds of castings. No doubt injustice is now done enterprizing men by imitators who make use of designs which have cost a great deal of money to get up. But if there is no invention in these designs, we do not see how the Government can interfere to prevent it; and we decidedly think that it ought not to interfere. The effect of espionage, such as this bill would call forth, is to be seen in the scandals which the operations of revenue informers have lately produced in some of the best known business houses in this country. There is a loud outcry against the continuation of laws which permit cases of such undoubted injustice to be increased in number, and we doubt if this bill would receive the support of the manufacturing community. We have pointed to the notorious 'revenue cases' as an example of what would be the probable result of passing this law, and we will add that the firms which have suffered most seriously by the operations of informers are not those small and weak concerns which might be supposed to be the surest victims of the law, but they are among the most prominent and powerful houses in the country. The bill under consideration is probably the work of some 'leading' manufacturers, who think to protect themselves against piracy. Unless this law forms an exception to others of its kind, it is precisely the leading ing men among manufacturers who would probably feel its rigors."—*Engineering and Mining Journal.*

The foregoing remarks seem to us well founded, and to the protest of our cotemporary we can add our own against such unnecessary tinkering with the protective power of the Government. The above measure virtually prevents a farmer from re-casting his plow point; it prevents the printer from duplicating his type pages by electrotyping or stereotyping. We might continue and cite other instances where the sole effect of the law will be simply oppression and a retardation of industry, in lieu of a furtherance of its best interests. The act is a legitimate outgrowth of the misconception regarding the nature of our patent laws, which is now so prevalent, and which seems even to have extended to the eminent senator from Massachusetts. As we have repeatedly urged, our patent system is not devised for the purpose of compelling the community to pour their cash into the pockets of one class of individuals or manufacturers. Nothing is further from the spirit of our patent laws. To encourage industry and to promote the progress of the useful arts, to open new fields of employment in which all the people may freely enter, and thus to lead to greater material prosperity for the whole nation, is the sole aim of the existing statutes, and the substantiality of this foundation is proved by the results of their operation during the past.

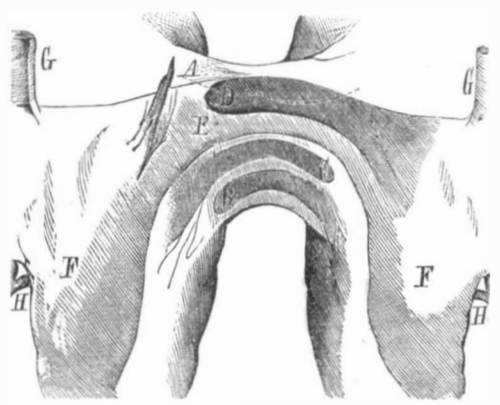
A man's best efforts are owing to his country, in entire abnegation of self and without fee or reward; so indeed are his goods and even his life. But while the people may, in times of need, take the latter and benefit by them, they have no means, however pressing the necessity, of forcing a person to invent; while, on the other hand, there are not many individuals who will give their time, labor, and ideas voluntarily, to the country, out of deference either to principle or patriotism, considered apart from other motives. Hence a stronger incentive is necessary; and this, out of expediency pure and simple, the law supplies in granting a limited monopoly. It cannot force people to invent, but it can bribe them; it can induce the individual to benefit the entire nation, by giving him a little extra emolument for himself; in brief, it uses the offer of a protected right, for a certain period, merely as a bait to produce inventions which are to be the free property of the public. The amounts realized by individuals for new ideas, though in some cases large, are insignificantly small in comparison with the value of the benefits conferred upon mankind by the origination.

Just so long as the notion is held that certain special manufacturers are the object of the solicitude of our system, and not the people, so long will such enactments as that of Mr. Sumner periodically make their appearance. If a manufacturer makes a casting of some new device, or casts something that has never been cast before, or even casts in an original and peculiar manner, he can submit his ideas to the proper authorities, have them passed upon, and, if they are suitable, obtain a patent which protects him in their enjoyment. Here there is evidently, for the reasons above given, an advantage gained for the community. But, under Mr. Sumner's law, any man is to be secured in perpetuity in the right of any mere casting, not because it is specially beneficial or useful to the people, but simply because he wants the Government to help fill his pockets by bolstering him up in a monopoly against everybody else. There is neither justice, expediency, nor reason in the measure.

THE AUTOPSY ON THE SIAMESE TWINS.

The report of the autopsy on the bodies of the Siamese twins has been made public through the New York *Times*; and so far as the dissection has progressed, it reveals some remarkable and unlooked for conditions in the physical constitution of the strange phenomenon.

The feature of greatest interest is connected with the ligament, which is about four inches long and eight inches in circumference, and a section of which is shown in the annexed diagram. There is a union at the two ensiform cartilages, which are joined at a point very near the median line of the band (dotted lines, A). Eng's process was much the more robust of the two, though neither cartilage was ossified. Besides this were three very curious pouches, the lower one of which, B, is only separated from the skin by a very delicate layer of tissue, and passes from the abdomen of Chang, and is lost in the duplicature of the suspensory liga-



ment of the liver of Eng. Above this is a second and similar pouch, C, belonging to Eng, and between this and the under surface of the ensiform conjunction, A, is the third and largest pouch, D, also prolonged from Chang's abdomen until it fairly reaches the peritoneal cavity of Eng, but is not continuous with it. Thus Chang had two pouches and Eng one. At E was found a connecting band between the livers, through which the plaster injection, used to fill the vessels, passed freely from the portal vein of Chang into the body of Eng. It is believed that the large upper pouch, D, belonging to Chang was once filled with true liver tissue, which at maturity became smaller, and ultimately left an empty space. At E is shown the connection between the livers, F F, and at G and H, the *vena cava* and portal vein of each body.

Chang's side of the band—on the right of our engraving—is the weakest, doubtless owing to the fact of his having been almost a constant invalid. Eng's portion is, however, well nourished and healthy. The peritoneum, it is found, is unquestionably prolonged into the ligament. Without entering further into the technical details of the dissection, the general result seems to point to the fact that a division of the twins would have been a very dangerous, if not fatal, operation, The two portal circulations were connected, and the peritoneal processes extended across the ligament, thus presenting great difficulties to the use of the knife.

Chang, it is believed, died of an attack of cerebral paralysis, and Eng of fright. The position of the hearts has not yet been determined; and a further report, regarding these organs as well as the lungs, will probably complete the investigation.

THE INDUSTRIAL USES OF BISULPHIDE OF CARBON.

Up to the year 1850, the sole industrial application of bisulphide of carbon was in the vulcanization and dissolution of caoutchouc; but since later invention has found means of producing the material at low price, it has been applied to a multiplicity of uses in a large number of the arts. The extraction of oils from grains, the wholesale removal of fatty matter from wool, the treatment of spices to obtain the same in soluble form, the fabrication of prussiate of potash by the Géles process, and of sulphocyanide of ammonium for the preparation of the toys called Pharaoh's serpents, the purification of crude paraffin, the manufacture of liquid fire for incendiary projectiles, and as a means of destruction of vermin, are a few of the principal employments of bisulphide of carbon, many of which have already been fully explained in these columns.

As respects magnitude, however, and future influence upon manufactures, its adaptation to the utilization of waste residues is of major importance, and is fast forming the groundwork of a new and distinct industry. The credit of first extracting the fatty matters from these refuse products, is due to M. Deiss, of Belgium, and by the aid of the bisulphide, the former are obtained in quantities sufficient to serve for lubrication of machinery or the fabrication of soaps and candles.

In order to show the rapidly increasing value of this useful substance, we have gathered from foreign contemporaries quite a number of its most recent as well as most important applications, and are thus enabled to present a fair view of the various refuse matters, in connection with which it is now employed. In the manufacture of fatty acids, brown compact deposits are precipitated. These, mixed with sawdust in order to facilitate the action of the bisulphide, and treated with the latter yield, up to twenty per cent of acids, which otherwise would go to waste. The pasty mass of metal filings, dirt, grease, etc., taken from car and wagon axles, is first treated with hot sulphuric acid, then with bisulphide, and, lastly, washed and dried. This isolates the grease in a saponified state. Cotton waste, employed in or about machinery, is freed from its grease by bisulphide and is again available for use. Residues of the manufacture of beeswax, which formerly found no sale except as manure, selling at about two dollars a hundredweight in France, are now subjected to the action of bisulphide and an excellent yellow wax is extracted; the final residue is still useful as a fertilizer.

Sawdust which has served to filter oils purified by sulphuric acid yields after pressure 15 per cent of oil; again, 50 per cent of oil is obtained from the muddy deposits due to the mingling of oils with sulphuric acid. These are washed in boiling water, dried, mixed with sawdust, and lastly treated with bisulphide. Balls of oleaginous grain, when they cannot be used as food for cattle, yield fatty matters; and their residue is an excellent fertilizer, as it contains large proportions of nitrogenized substances and phosphates. Bisulphide is also used to extract the grease from olives after they have been pressed, and from residues of tallow and suet after melting and pressure, also from the residues of the manufacture of cocoa. Bone fragments, when treated with bisulphide at 104° Fah., yield 12 per cent of grease, they are subsequently unfit for the manufacture of gelatin, but answer excellently for the fabrication of bone black. The cleanings of wool cards, when acted upon by bisulphide, give about 30 per cent of fatty substances, utilizable for the manufacture of soaps.

It is evident from the great number of waste products, and the abundance of some of them, that a very considerable amount of greasy and oleaginous matter can be returned to the various industries through the new processes involving the use of bisulphide. The material has also been successfully employed in the scouring of wool and in the extraction of bitumen from schists and bituminiferous sandstones. In the latter case, the quantity of bitumen obtained is from 4 to 5 per cent superior to that furnished by distillation, which only gives in all from 7 to 8 per cent. MM. VanHaecht, Emile, & Co., of Belgium, exhibited in the Vienna Exposition a number of improved machines for carrying on these processes, and in which all species of fatty residues could be treated. The price of manufacture does not exceed, for certain purposes, $2.40 per ton; about half a tun per hour can be treated. The loss of bisulphide is reduced to barely ½ per cent.

TELEGRAPHIC PROGRESS IN 1873.

A submarine cable has been extended along the eastern coast of South America, uniting Para, Pernambuco, Bahia, and Rio. The inauguration of this line was celebrated in the presence of the Emperor of Brazil, on the 23d of last December. In a short time, the wire will be prolonged to Montevideo, and then both American continents, from Canada to the south of Brazil, will be in telegraphic connection with Europe. A fourth cable was successfully laid between England and the United States during the month of July. In Africa, owing to the Ashantee war undertaken by Great Britain, the telegraph has been introduced to a limited extent. In Australia, considerable progress has been made in erecting lines between Queensland and the western portion of the continent. It is proposed to connect New Zealand and Australia with a double cable, also extending from Queensland to India.

The use of the duplex system has become wide both in England and in our own country. We note a curious inven-

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tion by Mr. Viquier, of Shanghai, China, by which dispatches are sent not only in the Chinese language but printed in its intricate characters. The automatic plan in the United States is proving quite successful, and in public tests has accomplished some remarkable feats in rapid telegraphing.

With regard to batteries, in spite of the improvements in those of Grove, Bunsen, Leclanché, May, Davy, and others, it seems that we as yet have none that is absolutely constant, though it may be that future modifications of the secondary batteries of Planté will lead to such a result.

Sir Richard Glass, Sir Francis Ronalds, and Auguste De la Rive, all prominent in the history of telegraphy, have died during the past year.

ROBERT L. THURSTON.

We notice with sincere regret the death of Mr. Robert L. Thurston, one of the oldest manufacturers of Providence, R. I., and father of Professor R. H. Thurston, of the Stevens Institute. Mr. Thurston began as a machinist, at a very early age, and had but attained his majority when he became interested with John Babcock, Sr., in the building of an experimental engine and a tubular boiler, which were placed in a small ferry boat used near Fall River. The performance of this craft induced her builders to construct two more vessels, the Babcock and the Rushlight, which, plying between Providence and New York, created a sensation equalled only by that occasioned by Fulton's Clermont. In 1830 Mr. Thurston embarked in business in Providence, R. I., and, after several changes of firm, ultimately formed the well known concern of Thurston, Greene, & Co., the first manufacturers who ever built a standard form of expansive steam engine. Mr. Thurston was not fortunate in monetary matters, and at the begining of the war incurred heavy losses, which, coupled with his advancing age, led to his retirement, from active business life, during the summer of 1863.

The subject of this brief sketch will be widely lamented, not only by the large number of work people with whom, during his long and useful life, he has been brought in contact, and who have experienced his uniform kindness and benevolence, but by all generally, as one of those representative men whose name will always be linked with the material growth and prosperity of the country.

STEARIN CANDLES.

The hard white stearin candle of today is quite a different article from the tallow dip that our grandmothers used to make, and which was then a vast improvement over the pine knot of the preceding generation. Tallow dips were made directly from the tallow, which was obtained by melting beef suet and straining it to remove animal fiber and impurities. Stearin candles are also made from tallow; but in this case it is first separated into its constituents, some of which are solids and others liquids, and only those melting at a temperature above the ordinary summer heat are employed.

Tallow is a mixture of stearin, palmatin, and olein, compounds of glycerin with stearic, palmitic and oleic acids respectively. Oleic acid and glycerin are both liquids at ordinary temperatures, and hence it is desirable to remove them from the tallow before employing it in the manufacture of candles. To accomplish this, several methods are in use. The simplest and one of the best is that invented by Wright and Fouché, and consists in decomposing the fat with superheated steam.

The apparatus employed is called a digester, and consists of two copper boilers, placed one above the other and connected by two pipes, one of which reaches nearly to the bottom of the lower vessel and ends at the bottom of the upper one. The other is fixed to the cover of the lower one and enters the upper one near the top. The melted fat mixed with an equal quantity of water is run into the digester, which is not completely filled and is heated for 15 hours under a pressure of eleven atmospheres. By the end of that time the glycerin becomes separated from the fatty acids, and is dissolved in the water. The contents of the digester are then blown into large vats where they are allowed to settle, and the fatty acids, being specifically lighter, rise to the top, the glycerin water settling to the bottom. As soon as this has taken place, the glycerin water is drawn off into a tank below and heated by a steam coil to evaporate the water, the evaporation being kept up until the glycerin acquires a specific gravity of 25°. At the proper moment, when all the glycerin water has been drawn off, the mixed fatty acids are run into large lead-lined vats. Here they are mixed with a small quantity of oil of vitriol to purify them, and heated by a steam coil. Then the liquid flows into a much larger vat beneath, from which it is run into pans, about 10 inches wide by 18 long and resembling huge cakes of chocolate. These pans are arranged on racks and the acids allowed to crystalize. The fat now solidifies, but it still has distributed through it the oleic acid. To remove this, the cakes are wrapped in strong cloth, usually hair cloth, and submitted to the action of a powerful hydraulic press, whereby a large proportion of the oil is squeezed out.

When no more oil can be pressed out, the pressed cakes are taken directly from this press and, without being unwrapped, are placed in a horizontal press between plates of iron and heated by steam pipes, where still more of the oleic acid is removed. The pressed cakes, although nearly pure, are again melted, treated with dilute sulphuric acid, and subjected a second time to hot pressure. This furnishes a very solid, perfectly white substance, consisting principally of stearic acid, improperly called stearin, with some palmitic acid. From this, the candles are molded in the usual manner

The oil which is pressed out consists of oleic acid holding in solution more or less of the solid acids, which it is desirable to save. For this reason, it is taken back to the tanks where the acids are melted, and mixed with them to be worked over again. It is finally sold for washing wool, softening leather, or making soap.

Another method of separating stearic acid from the glycerin and oleic acid, formerly much used, consists in saponification by means of lime. When lime is added to melted tallow and heated, the fatty acids combine with it to form an insoluble lime soap, the glycerin remaining in solution. The lime soap thus formed is decomposed with sulphuric acid, sulphate of lime being precipitated, and the melted fatty acids rise to the surface. The latter are transferred to lead-lined tanks, treated with oil of vitriol, drawn off, cooled, and pressed cold and hot, as in the other processes. If superheated steam is employed, a much smaller quantity of lime is required. At a pressure of ten atmospheres, with 2 or 3 per cent of lime, saponification and decomposition are complete in seven hours. This process, invented by De Milly, is a combination of both the above, and effects a saving in time over the first, and a saving in lime and acid over the second.

A fourth method, quite different from any of the above, was introduced by Dubrunfaut in 1841. Unlike the other processes, it can be employed to decompose very impure fats from slaughter houses, bone and marrow fats, kitchen stuff, residues from refining fish oils, and the like. Oil of vitriol is added to the molten fat, a moderate heat applied, and the mass stirred for 15 or 20 hours. The neutral fat is thus converted into a mixture of sulpho-fatty acids and sulpho-glyceric acid. These are decomposed by running them into large wooden tanks lined with lead and one third filled with water, and heating to 212° Fah. After the fatty acids separate, they are purified with water; the water evaporated, and the acids carefully distilled by means of superheated steam, at a temperature of 500° Fah. to 650° Fah. According to De Milly's new process, the tallow is heated to 248° along with 6 per cent of oil of vitriol, and the action limited to 2 or 3 hours. It is thereby possible to obtain 80 per cent of the solid fatty acids in a condition at once fit for making candles without redistilation, only 20 per cent having to be distilled.

SCIENTIFIC AND PRACTICAL INFORMATION.

BLACK PHOSPHORUS.

M. Ritter considers that the color of the variety of phosphorus known as black is due solely to the presence of metals or foreign metalloids. Arsenic in commercial phosphorus causes the appearance of the phenomenon, on account of a separation of phosphuret of arsenic. No allotropic modification exists.

OIL SPOTS ON FINISHED GOODS.

It is an exceedingly aggravating occurrence to find a piece of cloth, perfect in every other respect, ruined by oil spots. They are most frequently due to sheer carelessness and neglect of cleanliness in oiling the machinery. Workmen should be instructed to watch for them, and, as soon as one is discovered, to hunt up the cause and remedy it forthwith. Cloth thus injured should not be left in folds, or, if such disposition is absolutely necessary, pieces of thick paper should be placed between to prevent multiplication of the defects by the oil spots coming in contact with the clean portions.

The *American Textile Manufacturer* says that the simplest and surest process for extracting oil spots is to saturate the spot with benzine, then place two pieces of very soft blotting paper under and two upon it, and press well; in some cases a hot iron is necessary; in others a high pressure, say 100 lbs. per inch, without heat is sufficient. By this means the fat is dissolved and entirely absorbed by the paper. To rub the oil spot with a sponge saturated with turpentine or benzine only spreads the grease.

A HUGE AEROLITE.

A correspondent of the *Chicago Times* says that an enormous aerolite recently fell in the vicinity of Farmersville, Livingston county, Mo. The shock of its impact with the ground is stated to have been like an earthquake, and the molten mass is described as fully twenty feet high above the soil, and some twenty-five feet in diameter. It presents the usual appearance of such bodies, being a black, shining mass of meteoric iron. Its size is unprecedented.

RUMFORD'S DETERMINATION OF THE MECHANICAL EQUIVALENT OF HEAT.

Professor R. H. Thurston recently submitted a note to the American Society of Civil Engineers, in which he presented a *résumé* of the history of thermodynamics as given by Professor Tait in his work on the subject. In this, Professor Tait places the services of Count Rumford as second in importance to those of Davy, as well as in the actual influence upon the growth of the science, and does not apparently consider them comparable to those of Joule.

Professor Thurston considers that, as it is well known among engineers that the ordinary unit of measurement of horse power is much too high for application in estimates of animal power, it would be more correct to consider the horse power of Rumford as 25,000 instead of 30,000 foot pounds per minute. In such case the mechanical equivalent, as deduced by the latter, would be 782·8, differing by only 1·5 per cent from the value now accepted, as determined by Joule half a century later, which is nearer the probably correct value than the result of any other investigation, and is even far more accurate than many results obtained by Joule himself. Professor Thurston thinks that we may claim for Benjamin Thompson, of Concord, N. H. commonly known as Count Rumford: 1. That he was the first to prove the immateriality of heat and to indicate that it is a form of energy, publishing his conclusions a year before Davy. 2. That he first, and nearly a half century before Joule, determined, with almost perfect accuracy, the mechanical equivalent of heat; and 3, that he is entitled to the sole credit of the experimental discovery of the true nature of heat.

HYDRATE OF CHLORAL AS A PRESERVING AGENT.

M. Personne reports that, beside the strong alkalies, all the weak ones, magnesia, the alkaline salts, including borax and phosphate of soda, all the animal alkaline liquids, such as blood and white of egg, transform chloral into chloroform when the mixture is heated to 104° Fah. Fresh blood to which chloral has been added, and which is retained at normal temperature, coagulates completely, keeping its red color, and remains without alteration. A piece of muscle plunged in a chloral solution of 10 per cent, became slightly pale in tinge and deposited a sediment; but after a few hours immersion, it dried rapidly and became sufficiently friable to be pulverized.

It is believed that chloral solution of the above strength may be used for preserving the most alterable animal matters. The author states that he has thus kept a cerebellum for more than a month in perfect condition. He recommends the addition of glycerin to the solution, to prevent the articles preserved from becoming rigid and dry.

THE CHILI INTERNATIONAL EXPOSITION.

The Republic of Chili has, through its representative, formally notified our government that an international exposition will be held at Santiago, to open in September 16, 1875. Some valuable general concessions are to be made to exhibitors at the exposition. There will be a reduction of fifty per cent in the price of freight from Valparaiso to Santiago and on lines belonging to the government. Articles, excepting such as relate to dress fabrics, furniture, house decoration, jewelry, glass, earthenware, and similar products of manufacture, together with those of mining industry, will be admitted free of duty. Those excepted will not be charged in case they are reshipped. Forty dollars will be allowed for the payment of the passage of any special workman or mechanic in charge of, conducting, or directing exhibited machines or industries, such workmen to be duly accredited with passports certified by the Chilian Consul at the port of their embarkation. A reduction is also to be made on the freight of goods on the way to the exhibition from the different lines of steamers running to Valparaiso, the amount of which will be made known shortly.

A BOILER EXPLOSION.

A correspondent, G. F. A., writes from Peoria, Ill., enclosing a newspaper slip which describes a disastrous boiler explosion at that place, on January 31. The boiler was new, having just been completed, and was undergoing a test by steam pressure. It had no safety valve, nor any means of relieving the pressure other than by a rupture. A steam gage was attached; and when this indicated a pressure of 139 pounds per square inch, the boiler exploded, killing one of the bystanders and severely scalding another, the person who was killed being completely dismembered. The boiler was broken into fragments, which were thrown to great distances. It appears that the correctness of the gage was doubtful, so that it was impossible to tell what was the actual pressure when the boiler exploded. Judging from the above facts, this was a case of reckless engineering, calling for the sternest censure.

We are greatly obliged to our correspondent for sending us an account of the explosion, as we believe that giving publicity to proceedings of this kind is one of the surest means of inaugurating more careful management. Will not our readers in all sections send us information on matters of this kind, enclosing extracts from the local papers? In this way they will render us valuable assistance in our endeavors to bring about a more enlightened system among those who are entrusted with the care of steam machinery.

TO NEW SUBSCRIBERS.

All subscriptions to the SCIENTIFIC AMERICAN will be commenced with the year, unless persons, at the time of remitting, request to the contrary. Nearly all subscribers preserve their numbers for binding; and in most cases where subscriptions are received during the first quarter of the year, if the back numbers are not sent, they are subsequently ordered. To save both the subscribers and ourselves trouble, the back numbers from January 1 will be forwarded, unless we are advised to the contrary. This course will be pursued till April 1, after which date the paper will be sent from the time of receipt of remittance; but subscription may commence at any time, at the request of the subscriber, The above regulation applies only to those who give no instructions, at the time of remitting, as to when they desire to commence.

Death of Three Eminent Scientists.

Max Schultze, the great German professor of anatomy, is dead. He was in the prime of life, and had just experienced the satisfaction of seeing his laboratory at Bonn, the most ample and elegantly constructed in Europe, finished under his immediate supervision. His death is a great loss to biological science.

WE regret to learn the premature death of M. Fernand Papillon, to whose interesting papers on phenomena of life (in *Revue des Deux Mondes* and other journals) we have repeatedly directed attention. The death is also announced of Dr. Legros, of Paris, who was poisoned in the course of his histological researches.

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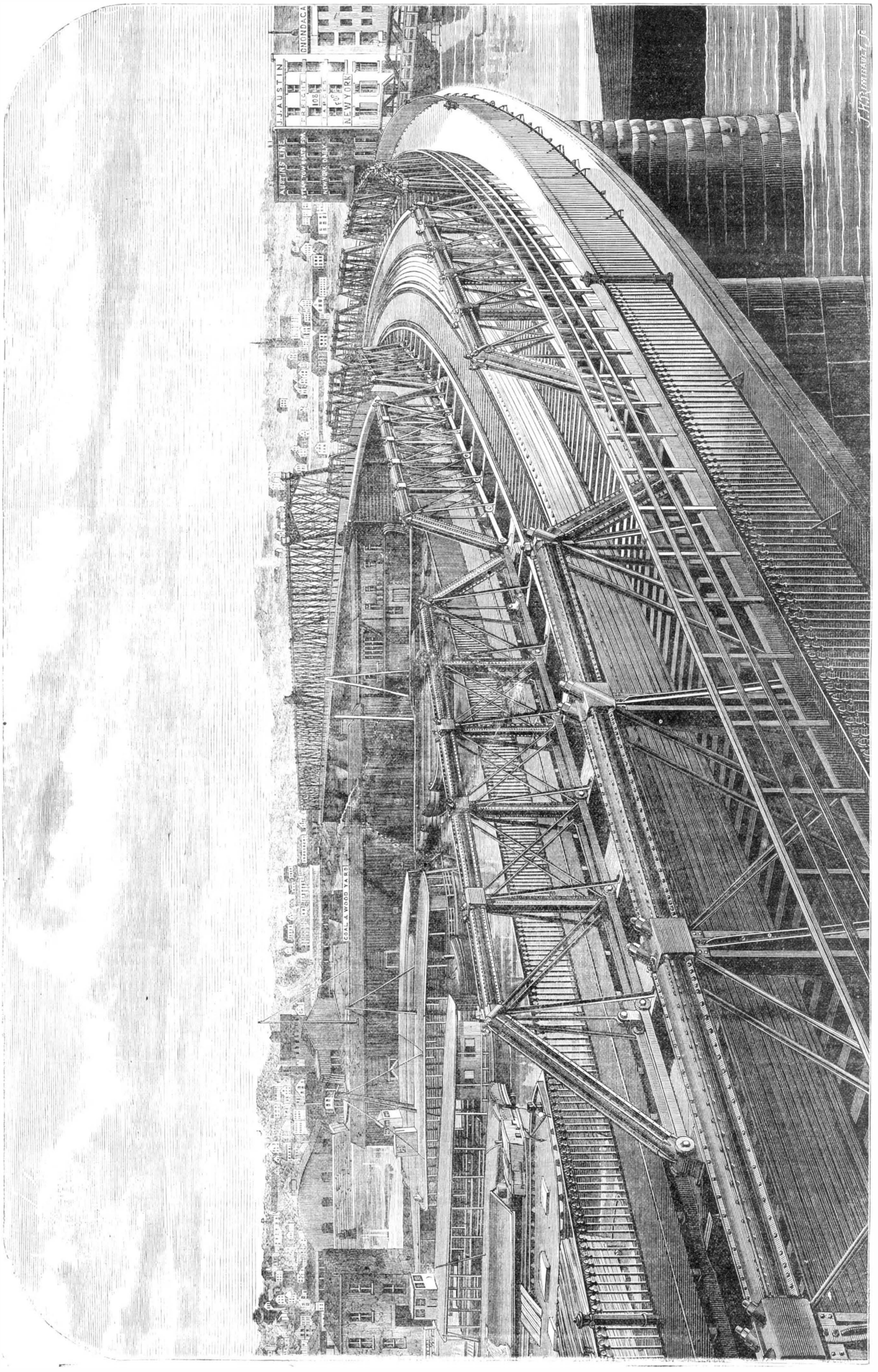

THE HUDSON RIVER RAILROAD BRIDGE, ALBANY, N. Y.

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THE ALBANY RAILROAD BRIDGE.

The large and handsome engraving which we publish on another page is an excellent view of one of the finest pieces of civil engineering work existing in this country. It is the largest double track iron railway bridge in the United States, and extends across the Hudson river at Albany, N. Y. Messrs. Clarke, Reeves & Co., the designers of the proposed iron centennial tower, were the constructors.

The total length of the structure is 1,740 feet,or nearly one third of a mile, and it consists altogether of fifteen spans, of which one is a draw span 274 feet in length. The superstructure is entirely of wrought iron, and the main girders are proportioned to carry a rolling load of 6,000 lbs. per lineal foot of bridge, in addition to the weight of the fabric itself. The turntable is operated by a steam engine, and is so constructed, that if any part wears out, it may be replaced whitout interrupting the use of the swing bridge; and suitable lever turning gear is also provided, so that, should it become necessary, the swing bridge may be operated by hand.

The engine and boiler, and all the machinery required to actuate the draw span, are situated within the turntable and are out of sight. The draw span can be opened and closed very quickly. When being swung, the weight is carried by the center and amounts to about 350 tuns, but the equilibrium is so accurate that it can be readily moved by two men.

The floor system of the bridge is rather stronger than is usually made in this country, and the system of construction generally was based on the plan followed at the Phœnixville works, which provides that the bridge does not fail to return to its original camber without readjustment after testing. To allow for expansion, one end of each girder is fixed to the pier, while the other end is carried upon rollers formed of lengths of 1¼ inches cold rolled shafting, mounted in wrought iron frames.

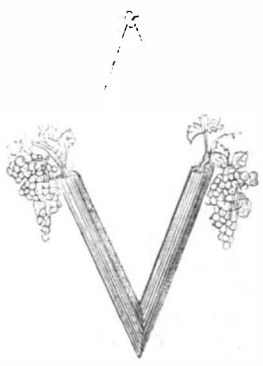
The weight of iron in the fabric is 1,750 tuns, and the total cost, including machinery, sidewalks, etc., was about $320,000. Our view is taken from the Albany side, at which point a new and finely arranged depot has recently been constructed.

A New Idea about Comets.

A paper was read before the Hackney Scientific Association on January 13, by Mr. Reeves, advancing an entirely new theory with regard to comets; and by the use of diagrams, he showed that the part of the comet termed the tail, being always in a direction from the sun and therefore as often in advance as behind the nucleus, is not really a tail. That as comets are transparent, and all matter is known to be either solid, liquid, or gaseous, comets must be the latter, for solids and liquids are opaque. That the only known power by which this gaseous matter can be held together is gravity, which must necessarily have a center, and, every part of the body being free to move, resolves itself into a sphere, the center of which is in many cases exceedingly dense, gradually attenuating towards the circumference. That the rays of the san are refracted in their passage through the spherical comet, thus luminating the portion beyond the center or nucleus, which illumination forms the tail. He then explained how all the various and peculiar phenomena of comets, such as their shapes, colors, horns, nuclei, as well as their being with and without tails, etc., arise; and that they are entirely in accordance with the universal laws of Nature.

Preserving Cut Bunches of Grapes.

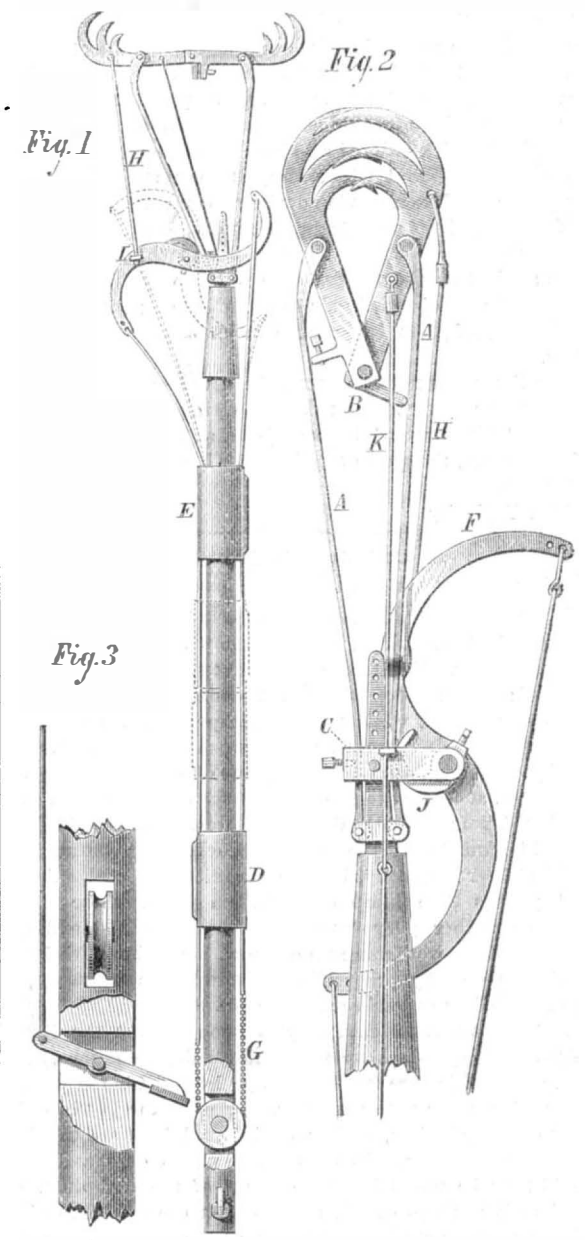
A correspondent of *The Garden* recommends the use of the ingenious little device depicted in our engraving, for preserving bunches of grapes in water, after they are cut from the vines. Any plumber can make the tin tubes for a few cents each, and they should be hung up, with the bunches, in the vinery; but a separate small house or hot frame, to which the heat could be turned on when necessary, would be an improvement. The house or frame should be well ventilated and free from damp and dust; and it would be useful for young vines in pots, cucumbers and melons.



IMPROVED FISH GRAPPLING SPEAR.

This invention, the object of which is indicated by its title, is an improvement of considerable merit over the old-fashioned fish spear. It is also excellently adapted as a substitute for the gaff, as its action is much more certain, while it requires less skill to manage. The grappling arms are easily and quickly set by ingenious mechanism leading to the handle, while there seems little about the apparatus to get out of order and so impede its working. Our engraving represents the device with its claws open (Fig. 1) and closed (Fig. 2), and also (Fig. 3) show the tripping arrangements in the handle.

The spear hooks are jointed together, as shown, and provided with springs, A, which are bent when the hooks are opened and so held by the toggle joint at B. The springs are arranged in a clip, C, and not permanently attached, so that the hooks may be released to facilitate their opening and setting. D and E are sliding sleeves upon the handle with which the rock lever, F, is connected by a chain, wire, or cord, G, which passes up over a pulley near the end of the stock. The rock lever communicates with the spear hooks by a wire, H, so that, by sliding the sleeves along the handle toward the hooks, the lever will be turned to the position shown in Fig. 1, to open and reset the hooks; and by moving the sleeves in the opposite direction, it will be turned back again (as shown in Fig. 2 and the dotted lines in Fig. 1), by sliding the swivel stud, I, back upon it to free the connecting rod, H, so that the latter will allow the jaws to close when tripped. The same operation subjects the springs to the required tension for actuating the hooks, by means of the cam, J, pivoted to the clip. A set screw is provided in connection with the cam for producing and varying the tension of the springs; and the clip is made adjustable on the stock and along the springs for the same purpose.



Generally the hooks are tripped by striking them against the back of the fish at the joint; but as, in case of striking a stone or other hard substance, the points might be injured, a wire, K, is connected to one of the prongs near the joint, and extends up to a small trip lever shown in Fig. 3. This lever, worked by the finger, pulls the joint back, and so trips the hooks.

Patented through the Scientific American Patent Agency, October 28, 1873. For further particulars address the inventor, Mr. Jonah W. Knapp, Cross Rivers, Westchester county, N. Y.

ASTRONOMICAL NOTES.

OBSERVATORY OF VASSAR COLLEGE.

For the computations of the following notes (which are approximate only) and for most of the observations, I am indebted to students. M.M.

Positions of Planets for March, 1874.

Mercury.

On the 1st of March, Mercury rises at 7h. 12m. A. M., and sets at 7h. 20m. P. M. On the 31st, Mercury rises at 4h. 59m. A. M., and sets at 4h. 37m. P. M.

Mercury should be looked for soon after sunset; early in March, some degrees north of the sun's place. Mercury and Venus pass the meridian or south at nearly the same time on the 14th, Mercury being, however, 6° north of Venus in declination.

Venus.

On the 1st of March, Venus rises at 6h. 50m. A. M., and sets at 5h. 50m. P. M. On the 31st, Venus rises at 6h. 14m. A. M., and sets at 7h. 4m. P. M.

The moon and Venus will be in conjunction on the 18th.

Mars.

On the 1st, Mars rises at 7h. 58m. A. M., and sets at 8h. 41m. P.M. On the 31st, Mars rises at 6h. 52m. A. M., and sets at 8h. 35m. P. M. It will be seen that Mars is very unfavorably situated for observations.

Jupiter.

Jupiter rises on the 1st at 7h. 12m. P. M., and sets at 7h. 30m. A. M. On the 31st, it rises at 4h. 54m. P. M., and sets at 5h. 18m. the next morning.

All through March Jupiter is in excellent position for observation, coming to meridian at midnight on the 19th, and nearly at midnight for the whole month. Its altitude, too in our latitude, is above 50°, and it can be studied to great advantage. Every person who has a telescope, even a small one, should watch the varied phenomena of its moons, especially on the evenings of the 7th and 18th. On the 7th, the largest of its moons will disappear by eclipse, passing into Jupiter's shadow, and the smallest will disappear by transit, coming between us and Jupiter, and being lost to view while projected on Jupiter's disk.

Jupiter and the moon are in conjunction on the 31st, when the moon is nearly full.

Saturn.

On the 1st of March, Saturn rises at 5h. 19m. A. M., and sets at 3h. 1m. P. M. On the 31st, Saturn rises at 3h. 30m. A. M., and sets at 1h. 18m. P. M. As this planet comes to the meridian in the forenoon and is far south in declination, it is not well situated for observation.

Uranus.

Uranus is in good position for observations, but needs a good telescope. On the 1st it rises at 2h. 48m. P. M., comes to meridian at 10 P. M., and sets at 5h. 12m. the next morning. On the 31st Uranus rises at 0h. 46m. P. M., and sets at 3h. 12m. A. M. the next morning. It is still among the small stars of *Cancer*, a few degrees south of *γ Cancri*.

Neptune.

On the 1st, Neptune rises at 8h. 32m. A. M., and sets at 9h. 34m. P. M. On the 31st, it rises at 6h. 37m. A. M., and sets at 7h. 42m. P. M. Even with good telescopes, no good observations can be made on Neptune at present.

Sun Spots.

The record is from January 20 to February 14 inclusive, and, though much broken by cloudy days, is yet regular enough to indicate that in the spots individually there has been no marked change, no sudden appearance or disappearance. On the 24th, spots appeared on the eastern limb which proved to be the advance of a large group, the whole of which was on the disk by the 26th. Photographs of the 29th and 30th showed the group still entire, and on these days the largest portion of it was seen with the naked eye. Observations were then interrupted until February 6, when what was probably the last of it was just within the western limb. On the 6th there was a small circular spot "coming on," that is, near the eastern limb, which was still seen on the 14th, having been carried during the interval to the opposite side of the disk, still maintaining its original shape. Five other small spots, on the 14th, extended east of the circular one, nearly in the line of the horizontal diameter. There were faculæ on the 10th and 14th.

Zodiacal Light.

This was seen, early in the evening, on the 4th, 5th, 11th, and 14th, stretching from the western horizon towards the Pleiades.

Barometer and Thermometer.

The meteorological journal from January 17 to February 13 gives the highest barometer, February 2, 30·63; the lowest barometer, January 28, 29·62; the highest thermometer January 23, at 2 P. M., 56°; the lowest thermometer, February 9, at 7 A. M., —11°.

Amount of Rain.

The rain which fell during the morning of January 28 amounted to 0·12 inches.

The rain which fell between the afternoon of February 13 and the morning of February 14, amounted to 0·13 inches.

Patent Calf Feeder.

In these days, when the successful rearing of cattle is an important item of farm management, a wide difference may be seen in the appearance of two calves—the one fed by a painstaking hand, and the other allowed to gulp down its food without time for admixture with the saliva. This is a very important matter, seeing that success or failure frequently depends upon it. Of course, the nearer the process of feeding is approximated to the slow natural action of sucking, the better for the young animal. The implement shown in our illustration, for which we are indebted to the *Ironmonger*, if properly cleansed from time to time, feeds in the most natural manner and renders it impossible for the calf to gorge itself. It is a vessel of galvanized iron, shaped like a milk can, having upright sides and concave bottom, with an iron bale handle and a splayed hoop foot, which causes it to stand firmly on the ground. Midway in the vessel is a fixed ledge, into which a self-locking cover closely fits. This cover has a vulcanized india rubber teat, fixed in its center and communicating with an india rubber tube extending to the bottom of the vessel, the concave nature of which allows of the calf making a clean meal. The vessel holds about five quarts, and can be readily cleaned by removing the cover. The new feeder entirely dispenses with the unpleasant and dangerous practice of feeding with the finger, and the food is not so liable to be wasted.

TO TAN SKINS.—The following method is recommended by a correspondent: Take equal parts salt, alum, and Glauber's salt, and half a part saltpeter; pulverize and mix. Handle the skins and rub the mixture in well three or four times a day, the oftener the better. If there is not moisture enough in the skin to dissolve the salts, put a little water into the latter. We are assured that no moth will attack furs, the felts of which have been thus prepared.

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Correspondence.

Mr. Richard A. Proctor and the Million Dollar Telescope.

To the Editor of the Scientific American:

Mr. R. A. Proctor, whose most interesting and instructive course of lectures has just closed in this city, was inclined to doubt the possibility of making a telescope much superior to Lord Rosse's. He also stated, in the lecture of January 19, in regard to Mr. Lick's Rocky Mountain Observatory, that "the proposed magnifying power of 8,000, to bring the moon within 30 miles, was impossible." (240,000÷8,000=30.) Now Lord Rosse, an accurate and conscientious observer, permitted himself to record an observation made with a power of 6,000 diameters, that is, he made out the object nearly as well as if he had used a lower power. In this same way, the power of one hundred diameters for each inch of aperture, instead of fifty diameters, may be applied to a good objective during the 100 hours, or thereabout, of suitable weather which occur during the year. Mr. Proctor, having been informed more fully with regard to the million dollar telescope scheme, and having been requested by us to give his views on certain matters of interest connected with the subject, on the 20th inst., made the following graceful compliment to the world's most skilled optician, and to the magnificent project which bids fair to be realized at no distant date:

"And here let me mention the superiority of the refractor at Cambridge to the Rosse telescope; and let me allude also to the possibilities of great future discoveries by means of a telescope, to be five feet in aperture, which, it is said, your optician Alvan Clark proposes to make, at a cost, I believe, of $1,000,000. That amount will be wanted. It seems a considerable sum. But if any one can do it, it is Clark, for he is unrivaled as an optician. Mr. Cooke, of England, was the only optician comparable with him, but he is dead. I have never had an opportunity of making any comparison between the great telescope of Cooke, 25 inches in diameter, which is used in an inferior atmosphere, and was completed in the hands of his successor, and those of Clark. The telescope at Washington is 26 inches in aperture. But now that Cooke is away, Clark is the greatest of living opticians; and if a telescope is to be made, it is to be hoped he may be spared to make it." Mr. Clark informed me last summer that he did not expect to live long enough to finish such a work, but both he and his son Alvan expressed a willingness to undertake the construction of a million dollar equatorial, if the money were raised for the purpose, the object glass to be 5 feet 6½ inches clear aperture, and focus 75 feet. The flint and crown disks would be made by Messrs. Chance, of Birmingham, England, or specially in the United States. It will not be found difficult to make large glass disks of homogeneous "metal," if the proper materials are used with the requisite care.

The common glass crucible is built up gradually in rings of about two inches in hight, the clay being constantly mixed and trodden by the naked feet of the workman. The fabrication of the melting pot thus requires an entire year. The same care should be devoted to the materials to be placed inside. Optical glass of the very best quality, free from streaks, should be selected and crushed. Fragments of uniform specific gravity should then be sorted out by the hydraulic bucket or an equivalent mining appliance for the separation of ores. These glass fragments, of uniform quality and size, should be charged into the crucible, and melted in the most intense heat attainable in a Siemens' gas furnace, then cooled as slowly as possible, and the central part of the mass sawn out. This mass of perfect glass may be reheated if necessary in the usual disk mold, to soften and flow by its own weight into the requisite shape. Mr. Clark says that the flexure due to the weight of a large object glass does not appear sufficient to disturb its corrections. A reflector, however, such as the 4 foot at Melbourne, can hardly be prevented, by the most elaborate system of counterpoise levers, from bending so much as to distort the image.

Dr. Draper's fine lunar photographs, although taken with a 15½ inches Newtonian silvered glass mirror, supported on an india rubber air cushion, the eyepiece driven by a clepshydra, are hardly as sharp in definition as those of Mr. Rutherford. The latter were taken with an 11 inch refractor with a second flint lens in front of the object glass, corrected by continual trial photographs of stars until the combination converged actinic rays to the same focus. The equatorial is driven by a Bond spring governor clock. At present Dr. Draper's 28 inch silvered glass reflector and Mr. Rutherford's 13 inch triple photographic objective may be regarded as typical specimens of their respective kinds. I infer, therefore, that while the silvered glass reflector is cheap and possesses no chromatic aberration, yet the achromatic is by far the best for accurate work.

European opticians (so Messrs. Merz & Steinheil assured me, in Munich) generally try to get an absolutely homogeneous glass, to work in spherical curves, according to the formula of Gauss. Mr. Clark, choosing simple curves, and the best glass he can get from Messrs. Chance, excels all others in the exquisite delicacy of his local corrections for slight want of homogeneity in the glass, incorrect figuring, etc. You described his method of recorrection, as applied to the Pittsburgh 13 inches telescope, in the SCIENTIFIC AMERICAN of September 20, 1873. Mr. Clark was formerly a portrait painter, and gained, in the practice of his profession, the sensitive touch and correct eye necessary for the work endorsed by such critics as the late Rev. Mr. Dawes and Dr. Huggins. Dawes' double star work was accomplished mainly with a seven inch glass by Clark, and Huggins splendid researches, on the spectral character and composition of stars and nebulæ, were prosecuted with an eight inch by the same maker.

All observers are not aware that, when a perfectly corrected object glass is uncovered to the sky, it must be allowed to radiate heat for about half an hour before the spherical aberration becomes zero.

I read that Mr. Lick has entrusted Colonel Von Schmidt, an eminent engineer, with the location of the Rocky Mountain Observatory. This task I regard as almost equally onerous and important with that of the optician.

The splendid 18 inches, belonging to the Dearborn Observatory at Chicago, is almost utterly useless (or was when I saw it), being perched in a high, ill ventilated tower halfway up the College building, in currents of heated air, and subject to unequal radiation from surrounding objects.

Professor Safford informed me that he intended to have the equatorial removed from its perch and placed on the ground, where it could be used, if possible.

Mr. McCormick ordered a 26 inch equatorial, a duplicate of the one at the Naval Observatory, to be made at the same time with the latter. It is now being completed.

The principle of interchangeable parts, found so advantageous in the construction of smaller machines, has thus been applied on the largest scale to the mounting of great equatorials. This wholesale construction of giant telescopes is of course of great importance in an economical point of view.

The SCIENTIFIC AMERICAN million dollar telescope may therefore be constructed at the same time as Mr. Lick's, to the great advantage of both projects, and the advancement of astronomy, the queen of sciences, whose domain includes all others.

New York city. S. H. MEAD, JR.

Utilizing Coal Dust.

To the Editor of the Scientific American:

Many efforts have been made, directed towards utilizing the coal dust screenings, which are now the waste products of most mines. Some have proposed to saturate them with coal oil; others have invented machines for compressing them into blocks; while a late correspondent has proposed mixing them with corn, that the compound might be burned. I think that, for steam purposes, none of those processes are necessary, at least with the bituminous coal dust such as is produced from the coal mines of Illinois. On examination, it will be found that the dust, or slack, from bituminous coal is better in quality, being less adulterated with sulphur and pyrites than lump coal. When furnaces for steam boilers or other purposes are properly arranged, and the dust is not too wet from rain or snow, it will burn freely by itself, without any preparation or admixture whatever, as the facts below narrated will fully show:

In 1868 it became necessary to remove, from the Home Woolen Mills, of Jacksonville, Ill., of which I was the manager, sectional boilers (patent) of one hundred horse power, and replace them with new ones. I resolved to put in ordinary cylinder boilers, having five internal flues and rated at eighty horse power. At all the coal mines of that section could then be found immense heaps of the coal dust, or slack as it is there called, abandoned as worthless, and in almost all cases continually burning from spontaneous combustion. I resolved to set the new boilers and construct the furnace with the view of using this waste product exclusively for fuel. Before starting the fires, I made a contract for all the slack (in case I succeeded in using it) the mill would need, the same to be delivered on board the cars at twenty-five cents per tun. The experiment proved succesful; and from that date, until the burning of the mills in 1873, that fuel was used exclusively, with the exception of a few months one summer (when so little coal was being mined that slack could not be had), and an occasional car load of coal when the other failed to arrive. With this as fuel, an engine of 75 horse power was run, driving the machinery of a four set woolen mill; and direct steam was also supplied to dye house, dresser, wool and cloth drying machines, and in cold weather to the heating pipes necessary to heat the entire building, containing 38,000 square feet of flooring. In use, the slack was found nearly as effective as coal; and from that long experience in its consumption, it was fully established to be only about twenty per cent inferior to the best lump coal, tun for tun, for equal amounts of steam. After this mill commenced burning it, the superintendent of the mines found that the cars could not be loaded at the price originally named, and fifty cents per tun (delivered on board cars) was agreed upon as the price: and that price, and no more, was paid to the mines for the four years of its use. During the same time, lump coal on board cars at the mines ranged from two dollars and a half to three dollars per tun. Under the new boilers, much less of this dust was used for fuel than had been previously used of the best lump coal under the sectional boilers, although the amount of machinery was considerably increased.

After the economical use of this fuel had been established in the Home Mills, the proprietors of other mills examined into the manner of using it, and also adopted it. For the past two years, another woolen mill at Jacksonville, and one at Springfield, Ill., each using seventy horse power engines, and direct steam for other purposes, have been utilizing coal dust in their furnaces. Others in the same section of the State have adopted it, and it is now established beyond all question that it can be successfully burned in the manner above stated. Even in starting fires, no other fuel is necessary, except a few handfuls of kindling wood, such as used with lump coal.

To arrange for burning the coal dust, no considerable change in furnaces from ordinary construction is necessary What is true for the proper burning of lump coal is absolutely indispensable for the dust. The rules are simple and easily understood: A large supply of air in the furnace, regular feeding, open fires, and a good draft. When black smoke is seen coming from the chimney, these requisites are not all present. In fact, no more black smoke should ever be seen coming from a furnace burning either dust or lump coal than from one burning wood, and no coal-burning furnace is properly constructed for its work which emits, for more than a half minute at a time, sufficient smoke to be observed without very close inspection. In the case of the Home Mills, although the chimney was but fifty-four feet high, it was rarely that any smoke whatever could be seen. The engineer in charge understood his business thoroughly, was reliable, and always saw that the furnace was in proper order. That, indeed, was one of the principal causes of continued success, and will always be found to be all important.

The use of slack under steam boilers alone has been adverted to, but it can be used for almost any other like purpose. Those persons using considerable amounts of coal, who can obtain dust at low rates, need have no fear that they will fail if they will follow the above suggestions. No compression into blocks, admixture with coal oil, or adulteration with corn is necessary. A faithful fireman to shovel in small and regular supplies, an open fire, and a good draft, will never fail to make as fierce and effective fire as lump coal, with a very large saving in cost.

Columbus, Ga. JOHN HILL.

Asphalt Pavements.

To the Editor of the Scientific American:

It is suggested that some mixture or mode of laying down asphalt pavements must be found, for obviating the tendency to greasiness. This greasiness is the cause of the slippery character of such pavements when wet or damp. Another great objection to them is the disposition to wash away with rain, to soften in the sun, and to crack on drying. These latter faults are caused by the want of an absorbent element to hold the volatile portions from evaporation and softening in the sun. This absorbent must be of a character that will not crack of itself, if mixed with water to a thin consistency and dried at slow heat. Sand, clay, ground slate, talc, Grafton mineral, lime, etc., are used at present for admixture in such compositions, but they do not possess the absorbent and non-cracking qualities. The mineral known as fuller's earth is, I believe, the best thing for this purpose. The peculiarities of fuller's earth, among similar minerals, are its powerful affinity for greasy matters, its finely comminuted character (it is an unpalpable powder when crushed, which is evinced by the readiness which a piece takes polish from the friction of the finger nail,) and its peculiarity of drying, rapidly or slowly, without cracking. These render it invaluable for really good and lasting pavement made from asphalt, coal tar, or other bituminous matters.

Two parts of fuller's earth, with one part of a mixture of asphalt and coal tar, or the asphalt alone, make a good compound for the purpose. INVESTIGATOR.

The Preservation of Timber.

To the Editor of the Scientific American:

I came here 30 years since, and began clearing land and building houses with hewn logs and boards split from the tree. After several years' residence I noticed very often that pieces of the same kind of timber decayed more quickly than others; and after much thought and observation, I came to the conclusion that timber felled after the leaf was fully grown lasted the longest. I noticed that timber felled when the leaf first commenced to grow rotted the sap off very quickly, but the heart remained sound; that timber felled after the fall of the leaf rotted in the heart, even when apparently sound on the outside. When fire wood cut in the winter was put on the fire, the sap came out of the heart; but when cut in the summer, the sap came out of the sap wood and next the bark. I noticed also that all our lasting wood had but little sap at any time in the heart: such as cedar, mulberry, sassafras, and cypress.

A cypress post cut in the summer of 1838 is still sound, although exposed to all weathers, while one of the same kind of timber, cut in the winter of 1856 and painted, has rotted in the heart. I saw yesterday a piece of gum plank, which I sawed in the summer of 1859, that has lain exposed ever since, and is perfectly sound; while oak timber that was felled in the winter before is now entirely rotten.

My conclusion then is: Cut timber after full leaf, say in July and August, to get the most last from it. The sap goes into the heart of the tree after leaf fall, and causes decay.

Arkansas. JAMES A. MOORE.

Fish in the Hot Springs of Nevada.

To the Editor of the Scientific American:

About 80 miles north of this place, on the north slope of Bull Run Mountain, which never loses its massive banks of snow, rises a small stream, formed by springs that furnish the purest and coldest water I ever drank. The stream, after running a distance of half a mile, is about 2 feet deep and about 6 feet wide on an average; at this point a succession of hot springs rise on the banks, and flow into the stream, increasing the volume of water about one third. The water of these springs is so intensely hot that less than three seconds are consumed in boiling eggs in it. The creek above and below this point swarms with fine brook trout; and strange as it may appear, to persons standing on the banks where the hot water is discharged into the brook and looking

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through the rising vapor, you can see hundreds of the fish swimming to and fro in the boiling element with as much indifference as though there were no hot water near.

This letter, if unaccompanied by an explanation, would undoubtedly pass for a Nevada fish story; but to satisfy the incredulous, I will give the result of my investigation, it being July when I visited the place. I took a common thermometer with me, which only registered to 130° Fahrenheit. A test of the water above the hot springs showed a mean temperature of 42°; fastening my thermometer to a pole, I immersed it above the influx of hot water; and keeping it as near the bottom as possible, I moved it gradually down stream. The result was a very low temperature at the bottom, gradually rising to 65° until I reached a point (a fourth of a mile down the stream) where the temperature became uniform throughout. This, it will be seen, shows that the hot water, having a specific gravity much less than the cold, retains its place on the surface, forming an upper intensely hot stratum, and leaving the lower water with its finny tribe undisturbed, and to all appearances swimming to and fro in one of Nature's caldrons.

This stream is one of the many that form the head waters of the Columbia River; and to this point, over eighteen hundred miles from its mouth, in the spring and fall, the salt water salmon come in hundreds to spawn.

Elko. Nev. G. A. F.

The Spider's Web.

To the Editor of the Scientific American:

It is commonly believed that spiders are able to project their webs to distant objects, thus bridging over the intervening space; but how this is done, I have never seen explained. Once I saw a small spider upon some projecting object above a table, before an open window, briskly engaged in trying to do something, without seeming to accomplish his object. I therefore watched him, and saw that, after attaching his thread to the projecting object, he spun down four or five inches, and then commenced climbing his thread, carrying the same with him, or, rather, winding it up into a ball. Having reached his point of support, he descended again, and wound up the thread as before. This he did three or four times, till his ball was nearly as large as the head of a pin. Then taking his position upon the top of his projection, he remained apparently motionless for half a minute, at the end of which time his ball had disappeared, and there was seen a delicate line, a foot or more in length, flying in the wind. He was evidently trying to attach his thread to a lamp standing in the center of the table; but he had miscalculated the direction of the wind. I then carefully broke off the flying thread, when, finding that he had failed to reach the lamp, he repeated the attempt, going through precisely the same movements as before. This he did four or five times, when, doubtless concluding that the fates were against him or that some one was interfering with his operations, he left for parts unknown.

Whether he projected his ball of silk, as the sailor does his coil of rope, or whether he merely unwound it, letting the free end fly in the breeze, I could not make out; but it is very certain that when the flying thread appeared, the ball beneath his feet had disappeared. J. H. P.

Franklin, N. Y.

The Curious Ways of Plants.

Who can account for the ways of plants, or explain why a certain species will grow in one place, and will not in another exactly similar, so far as human intelligence can determine?

The American aloe is a hundred years in getting ready to flower, whereas the gourd grows like Jack's bean stalk. Some wild flowers disappear on the advance of civilization; while, on the other hand, the plantain, if the truth is told, goes wherever Europeans go; and in this country was unknown until after the English came, following so closely on their tracks that the Indians gave it the name of "white man's foot."

Some varieties, as above intimated, may be found in a particular locality, and nowhere else within half a dozen miles. There is, for example, in this neighborhood, in central New England, one spot where are a few shrubs of the mountain laurel ("spoon wood") in a little patch by the roadside; and although this would seem the natural country for it, it can be discovered in no other place anywhere about.

Then there is the fringed gentian, which has been seen beside a secluded road some six miles away; but, with that exception, appears wholly unknown in the vicinity; yet the closed gentian is abundant. Another of the perversely disappointing flowers is the dog tooth violet; not, however, more capricious than the yellow violet and the noble liverwort (*hepatica triloba*), which, in certain dry maple woods, in the one case, and in open knoll-covered pastures, in the other, grow in great abundance; still, one might search acres of similar woods and pastures for them, all to no purpose.

Another case, somewhat in point, is the holly—indigenous, or at least one variety, to moist woods along the eastern border of New England; but so partaking of the aforenamed eccentricity, that he may count himself a happy man who can find it, and prove his success by great armfuls of it, wherewith to deck his house at Christmas. One gets glimpses of it while riding through some swampy tract on Cape Ann; the bright berries and evergreen leaves, so suggestive of English good cheer, betraying it. There, too, in summer, by searching diligently, one may find a species of magnolia, that being about its northern limit.

No common New England flower is so little to be depended upon as the trailing arbutus. It is difficult to determine what it wants. It abounds in gravelly knolls by the wayside, and thrives on the very edge of pasture bogs, and in the shade of woods; and yet, with all this versatility, there are many towns where it is never found, and where, though transplanted and tended with care, it cannot be made to live.

Quite opposite, in these respects, is the "cardinal flower," whose home is by the water side, the only place where it grows naturally, although the kind of water is not of imminent consequence, for it will do just as well in a dark nook under the up-heaved root of a willow, on the edge of a mill pond, in the muddiest ooze, as in the cleanest sand along a river's bank, its chief requirement seeming to be that it shall not be crowded; one stalk always standing by itself, independent of its kind, and not in close neighborhood to other plants. It is so adaptive that it will bear removal to a garden, taking kindly to its new conditions; and there it will come up, year after year, flaming out in live scarlet, in "one glorious blood red," as if nothing had happened to it.

There are other facts, more singular, as to the ways of growth and "hows" of blooming. One can understand that a grape vine may hold to its support by means of a tendril, while an ivy or a Virginia creeper secures itself by thrusting its rootlets into a crevice of a wall or in the bark of a tree; but why should a honeysuckle and a bean vine wind in opposite directions, the one going to the left and the other to the right? and either will swing on the wind, or sprawl over the ground, rather than turn the other way.

The ketmia opens at nine o'clock in the morning, and shuts at ten, as if it had a visual weakness; while a bed of portulaccas never expands unless the sun is out; and the hotter he shines, the wider they spread themselves; and the evening primrose waits until he has gone down, and then comes open with a snap, like a subdued kind of fire cracker.

But most unaccountable of all, perhaps, is the night-blooming jasmin. You see a simple tree-like plant, with a plain style of leaf, at the base of which grows a spray of yellowish green tubes, like lilac buds, suggesting, more than anything else, a string of small candles. You look at them in the middle of the day, and they are "only that and nothing more;" and you might, if you did not know their ways, forget all about them; but when evening comes, forgetting is impossible. The room is full of fragrance, rich as orange flowers, and almost as subtle as violets; and lo, your little candles are all lighted; and from somewhere about them comes that perfume which is so delicious and so mysterious as to its source. The next morning, they begin to contract; by noon, the five points are all close packed, and there is no scent to them or about them at all till night comes on again; and so they continue, scentless through daylight, but of exquisite sweetness when darkness appears.—*A. B. Harris, in the Christian Weekly.*

Machinery as applied to the Manufacture of Watches.

That our American cousins have gone far ahead of us in the application of labor saving machinery is a truism which has become almost stale by repetition, and is capable of proof by reference to their very complete "Patent Office Reports," or to the pages of their scientific and technical journals. Scarcely can we find a department of trade in which some automatic machine does not supply the place of dear skilled labor. But in no branch of manufacture has automatic machinery proved such a thorough success as in the production of watches. In the manufacture of small arms the application of machinery to the making of interchangeable locks and stocks revolutionised the trade, and to this manufacture are the Americans indebted for a system which has supplied them with a home-made watch, for a system which is ultimately to become the leading one alike in England, France, and Switzerland. It is useless for English watch manufacturers to say "the thing cannot be done; the machine-made watch cannot beat the hand-made English lever in the home market." To their own cost the record of the past proves the fallacy of such argument. Twenty years ago America was supplied with her better class of lever watches almost wholly by Coventry and Liverpool, the demand for a common article being met by a large importation of movements of Swiss and French make. To-day these latter countries supply still the enormous demand of the States for cheap work, but more than 90 per cent of the good lever watches are now of American make. The machine made watch has supplanted not only the product of the skilled French operative, but that of his more highly skilled English brother.

The reasons which have led to this result are diverse. National pride may have had something to do with this, but the protective tariff, so often put forward by the watch trade as the leading reason, has had positively nothing to do with the defeat of the hand workers, who gave up the contest ingloriously. The truth is that the American watch companies have never yet known anything of trade competition, have never yet been able to keep pace with the demand for their products, and the main portion of their success must be attributed to their machinery—to the fact which is becoming more and more evident daily, that machines planned by brains at once scientific and practical must beat the simply practical rule-of-thumb workman, and the arms and muscles of iron will outwork and outlast mere flesh and bone. At the present moment the watchmakers of England are unable to supply the home demand for their products, and it may therefore be *apropos* to draw attention for a few minutes to the machine system as applied in the United States. As is generally known, the English system divides the manufacture into a vast number of branches, in each of which the work is performed by hand, or by the use of very simple lathes, driven by manual or foot power. In only three instances in England are we aware of the employment of steam power in the production of watches, and in one instance only is duplicating machinery used, and then only in the production of the plated or the rough movements. The American system subdivided the manufacture into a much larger number of details, and apportions a machine to the perfection of almost each operation leaving not more than 10 per cent of work to the skilled workmen.

Not only do we find an advantage in respect of the watch-making tools proper; we find also very great superiority in the appliances for making these tools. The use of labor-saving contrivances in America in all the avenues of trade has giving rise to especial machinery for their production, and this is very noticeable in the watch factory machine shop. The screwing and sliding lathes are made to meet more varied requirements than are the English articles. Planers, tool are capable of adjustments which are not attainable, except in very expensive machines, in England; and in small form, with a 4 inch or 6 inch stroke, we have as yet failed to find the machine. Another most useful tool, which is an absolute necessity to the watch machine shop, is the universal milling tool; and indeed no machinist can afford to be without it, if he has once used it. Yet we can find in England no tool which can take its place, or which combines such a multiplicity of operations. It is adaptable not only for ordinary milling, but it can be used to cut straight or spiral reamers, drills, and mills. It can be arranged to cut spur or beveled gears, and it can also be used to cut straight or spiral cones. The movement and feed of the tool carriage is automatic, and it is provided with adjustments for any desired angle. Such a machine cannot but be a favorite with close workmen on fine work. A machine wholly unknown outside the watch factory is the parallel and cone grinder, a modification of course of the grinding tools now replacing the file in so many shops. This machine reduces to absolute truth and fit the hardened steel spindles and bearings which are the specialty of watch-making machines. By it any taper given to the spindle may be reproduced in the bearing, sleeve, or collar, and the fit is at once removed from the region of doubt. Any desired degree of finish, too, may be attained, that usually preferred being by the use of diamond laps. So it will beseen that, while the tools for the manufacture of watch machinery are very fine, here is no lack or means for the production of highly finished and perfect work.

The picture of this American machinery teems with lessons to the Englishman. To the machine manufacturer it speaks very loudly. We must all bear witness to the marvelous beauty and finish of some of our English lathes, with their ingenious compound rests, for the turning, etc., of shapedsurfaces. But nowhere in England can we see such lathes as we find mounted on the benches of the watch factory; nowhere on this side of the Atlantic can we see tools so well made and closely fitted or provided with such multiplicity of adjustments for the close correction of errors resulting from wear or otherwise. This state of things is due alike to the lathes and men of the machine shop, for the system has most certainly produced a set of workmen who are second to none as practical machinists, and, in all probability, cannot be equaled.—*The Engineer.*

Railroading at a High Elevation.

The Buenos Ayres *Standard* lately contained the following account of a trip made in a construction train from Arequipa, over the Andes. Among other places reached was Vilcomayo, 14,533 feet above the level of the sea. The newspaper man has reached these high altitudes. "As I write," says the tourist, "there lie before me copies of *El Ciudadano*, a newspaper published at Puno, and of *El Heraldo*, a newspaper published at Cusco, both of them being well printed and well written sheets, and both of them being published more than 12,000 feet above the level of the sea. Nor is either of these the champion climbist of the newspaper world. At Cerro de Pasco they issue a very clever gazette devoted to mining and the muses; and Cerro de Pasco is fourteen thousand feet above tide water. Of Vilcomayo, the writer says: "Here, amid the supreme desolation of the Andes, at a hight at which man in Europe does not dream of living, was a genuine railway village. There was an 'American hotel' two stories high, with a piazza, and some forty or fifty rooms for the accommodation of the railway people. There were all the buildings, station houses, machine shop, engine houses, coal yards, required for a large road. There were the cabins of the laborers employed on the work, many hundreds of men, Chilians (the Yankees of South America), Bolivians, Peruvians, whites, ladinos, Indians,—a motley multitude, but superior, both in respect to capacity and conduct, to the average navvies of Europe and the United States. With the early morning a further run of an hour at good speed brought us to the actual summit of the road, at 14,586 feet above the sea level, and we then began to descend the Atlantic slope."

Improvement in Tanning.

M. B. Picard reports a new system of tanning skins which is carried through without acid and in a much shorter time than is required by ordinary processes. He first boils the tan down in water, making a complete extract, and then frees the decoction by decantation from all residue and foreign substances. The strength of the essence thus obtained is regulated according to the quality, thickness, etc., of the hides to be treated, weakening it when necessary with pure water. It is placed in the pits in a cold state, and the skins are immediately thrown in. The latter are lifted and their positions changed three times during both the first and second days, twice during the third, and once a day afterwards. Ordinarily, eight days suffices to complete the operation, and the inventor states that the proportion of about 77 pounds of extract to 220 pounds of skins gives excellent results.

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IMPROVED SAW GUMMER.

This is a convenient and simple little implement, which may be readily attached to circular or other saws, and operated without necessitating the removal of the same from the arbors or attachments. It is readily adjusted, self-feeding, easily operated, and, according to the inventor, causes a large saving of labor and files, while materially economizing the power required to run the saw.

Fig. 1 is a perspective, and Fig. 2, a plan view. A is a curved slotted piece of metal, in which the saw to be gummed is rigidly confined by the set screws, B. The position of the blade is controlled by the adjustable gages, C. D is a mandrel, supported by the curved frame, E, which is pivoted to the piece, A, at F. Through one side of this frame the mandrel works with a screw thread, and consequently it has a longitudinal motion while it is being revolved by means of the cranks, G, on its ends. Near its middle is formed the cutting cylinder, into dovetail shaped grooves in which are fitted the cutters, I, which, from the movement of the mandrel, are compelled to give a drawing stroke. By this means the cutters are prevented from heating, and hence losing their temper. Confined between the cranks, G, is a bail, J, which moves back and forth with the longitudinal movement of the mandrel, and upon which is a wedge, K, which operates between the two rollers, L, one being on the bed piece, A, and the other on the frame, E. The effect is to force the cutting cylinder under the tooth of the saw as the mandrel moves along. The screw nut, through which the latter works, is made in two parts, one being a clamp, M, hinged to the frame, E, fastened by the set screw, and constructed as clearly shown in Fig. 1. Through the dovetailed and tapering form of the grooves in the cutting cylinder, the cutters, while operating, are forced into their sockets, and hence are not liable to become loosened. They can, however, be easily removed when worn out, or can be ground when dull without taking them from the cylinder, by simply unshipping the mandrel for the purpose. In operation, the device renders the usually tedious process of gumming the saw easy, expeditious, and perfect.

Patented through the Scientific American Patent Agency, by Mr. David Boyd, whom address for further particulars, at Ghent, Ky.

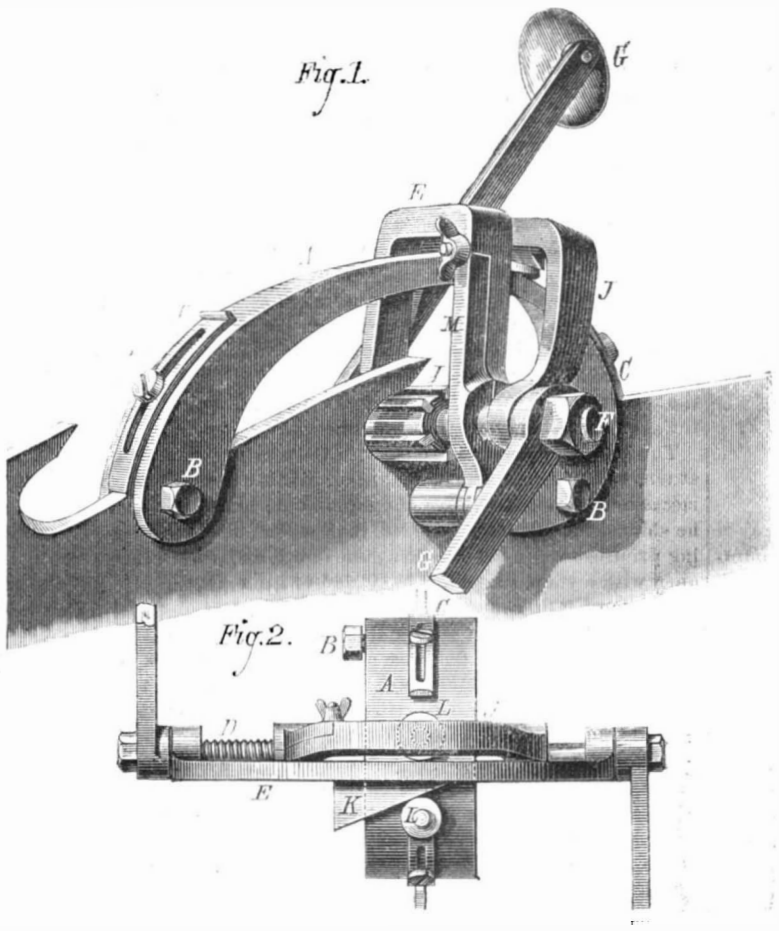
Australian Stupidity.

Nothing, however preposterous, if propounded as a specific for disease, is too absurd for people to believe in. A member of the Victoria Legislative Assembly recently seriously asked the Colonial Government to appropriate $25,000 to buy a diphtheria remedy from a man named Greathead. The latter remarkable person asserted that diphtheria is caused by "insects which breed in millions in a few days under a film which they make, which swells up in the throat and completely stops respiration," and he prescribes some drops of sulphuric acid in water. And this is the remedy for which the appropriation of $25,000 is asked.

IMPROVED ELECTRIC AND VAPOR CHAIR.

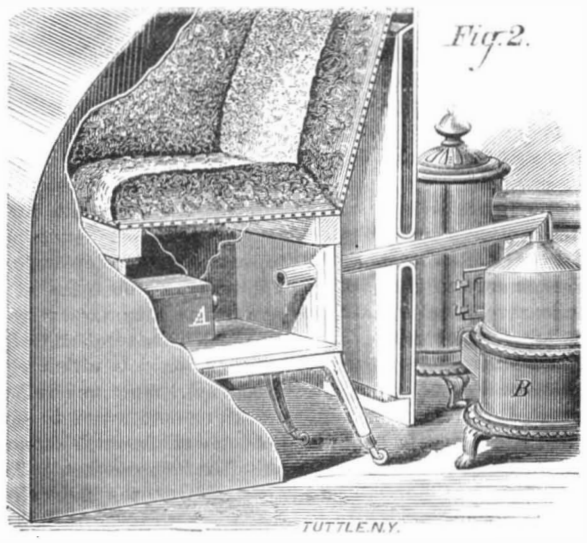
The invention herewith illustrated consists in a chair lined with metal and padded with sponge, so as to contain medicated liquids for curative purposes. In connection with the metal portions, a portable electric battery is arranged; and by suitable apparatus, as shown by our engraving, vapor is conducted to the body for opening the pores of the skin, etc. The patient, it is claimed, can receive through the saturated sponges the full charge through the system in the lightest or heaviest force, the device being alike capable of adjustment for either strong or weak subjects.

Fig. 1 shows the invention as adapted for the use of electricity alone. The base is made hollow, and its top of metal is perforated. The inside of the arms and back are lined with plates in order that one conductor of the battery, A, which is placed inside the base chamber, may be applied thereto, while the other is held by the patient, or else applied to some part of the chair, in order to be directed through the desired portion of the body. The feet are placed in a trough or rest, which is also lined with metal, and, with the remainder of the chair, as above noted, is covered with sponge. By a ratchet mechanism, the hight of the rest is readily adjusted.



THE LITTLE GIANT SAW GUMMER.

In Fig. 2 the adaptation of the chair to the administering of vapors in connection with electricity is shown. The battery is located as before described, and the vapor is conducted into the base by a tube from the generator, B. It then rises through the perforations in the seat, becomes charged with the chemicals with which the sponges are saturated, and thus acts upon the body. To confine the vapor, a case, shown broken away, may be employed, which incloses the chair and patient. There is an opening in its upper part to allow the head to protrude, and a flexible cape may be applied around the neck of the person to more fully close the opening. The chair is employed in cases of rheumatism, paralysis, impurities of the blood, colds, skin diseases, or for other medical operations whenever available.



Patented by Mary A. Hayward, September 26, 1871. For further particulars, address C. B. Townsend, sole agent, 242 Cumberland street, Brooklyn, N. Y.

Preventing Damage from Boiler Explosions.

A correspondent, Mr. George Mann, proposes to prevent the broken fragments of a boiler, from being hurled through space, and doing more injury even than the ruptured or exploded boiler will do by the emission of steam at the time. He suggests surrounding the boiler with a short link iron chain, winding it around the boiler continuously from one end to the other. The chain is to be drawn just so as not to hang loose, and to touch the boiler all round. There will be sufficient slack, so that the chain will not be strained over tight when the boiler is fully expanded to its utmost limit by heat. It is not intended to add strength to the boiler; but when the explosion comes, the chain is to hold the boiler *in statu quo*, allowing free escape to the steam only, while the broken fragments are prevented from flying round like so many cannon balls. The only damage which can occur would be the scalding of persons near by the steam. Mr. Mann claims this invention as his own, and hopes no one will try to steal his thunder.

New Improvement in Photo-Lithography.

M. Paul announces in *Les Mondes* a new process for transferring the photographic image to the stone. The ordinary process, we may remark, consists in producing a positive image on gelatinized paper, treated with bichromate of potash. After exposure, the whole is covered with lithographic ink, and washing with hot water follows in order to remove the non-modified gelatin. The image remains with its covering of ink, and by simple means is transferred to the stone.

The outlines thus obtained, however, M. Paul considers, fail in clearness because the hot water produces a swelling of the undissolved gelatin and softens the lithographic ink; and he states that, in the transfer, which requires pressure, the parts thus affected produce blurs. To avoid this, M. Paul substitutes albumen for gelatin, so that the washing can be done in cold water. The unaltered albumen after insolation is removed with a fine sponge. Very clean and sharp images, it is said, are thus produced.

The statement above made, to the effect that the bichromatized gelatin process is incapable of yielding fine lines, is incorrect. The Osborn process, used for several years in this city by the American Photo-Lithographic Company, yields prints of such perfection that only a practiced eye can detect any differences from the original in the finest lines.

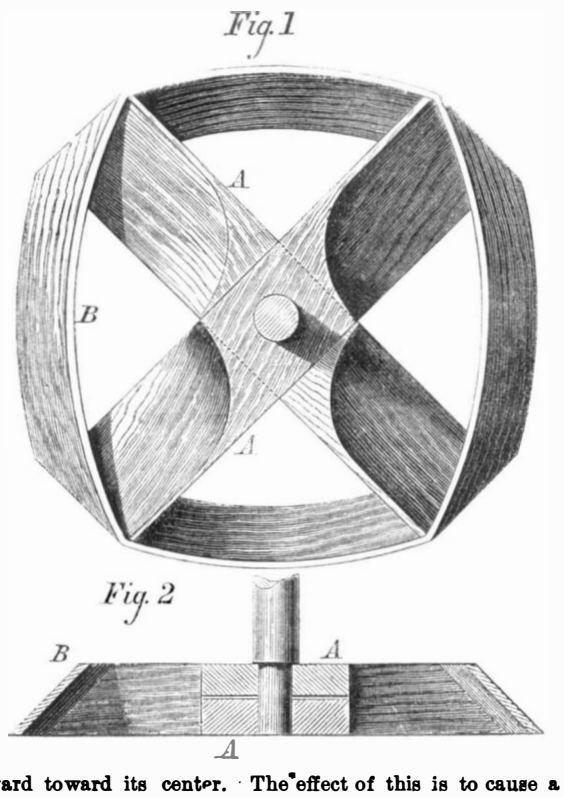
New Galvanometer.

Dr. Friedrich Müller describes, in *Poggendorff's Annalen*, a new form of galvanometer with improved reading and deadening arrangements. The needle is immersed in glycerin diluted with one eighth of water, and above it there is a horizontal tube of glass in rigid connection with it, to which the suspending thread is attached. Platinum wires bent vertically upwards from the ends of the tube are in a plane with the suspending thread. And the zero point of a scale, seen beyond, is in a line with these three parts when the needle is in its normal state of rest.

THE VICTOR CHURN DASHER.

The object of the improved dasher herewith illustrated is to increase the efficiency of the old fashioned up and-down churn. It is a simple and inexpensive device, but the inventor claims that it saves nearly one half the labor through the thorough agitation which it gives to the cream.

To the lower end of the dasher handle are attached the centers of two crossbars, A, which are arranged at right angles with and halved to each other, as shown in the sectional view, Fig. 2. The two arms of each bar are beveled in opposite directions, so that, as will be seen from Fig. 1, adjacent edges may both incline upward and toward each other, or both downward and from each other. B is a band attached to the outer ends of the blades, and so formed that the part which is opposite the faces of the arms which incline upward may slope inward and upward, and the part opposite the downwardly tending faces may incline downward and inward. By this construction, it is claimed, as the dasher is worked, four strong currents will be formed, two following outward towards the wall of the churn, and two following inward toward its center. The effect of this is to cause a very strong commotion in the milk, bringing the butter in a short time. One or more of these dashers may be attached to the handle, as may be desired, or as may be rendered necessary by the size of the churn.



Patented through the Scientific American Patent Agency, by Mr. David Boyd, of Vevay, Ind., December 30, 1873. For further particulars address David Boyd, Ghent, Ky.

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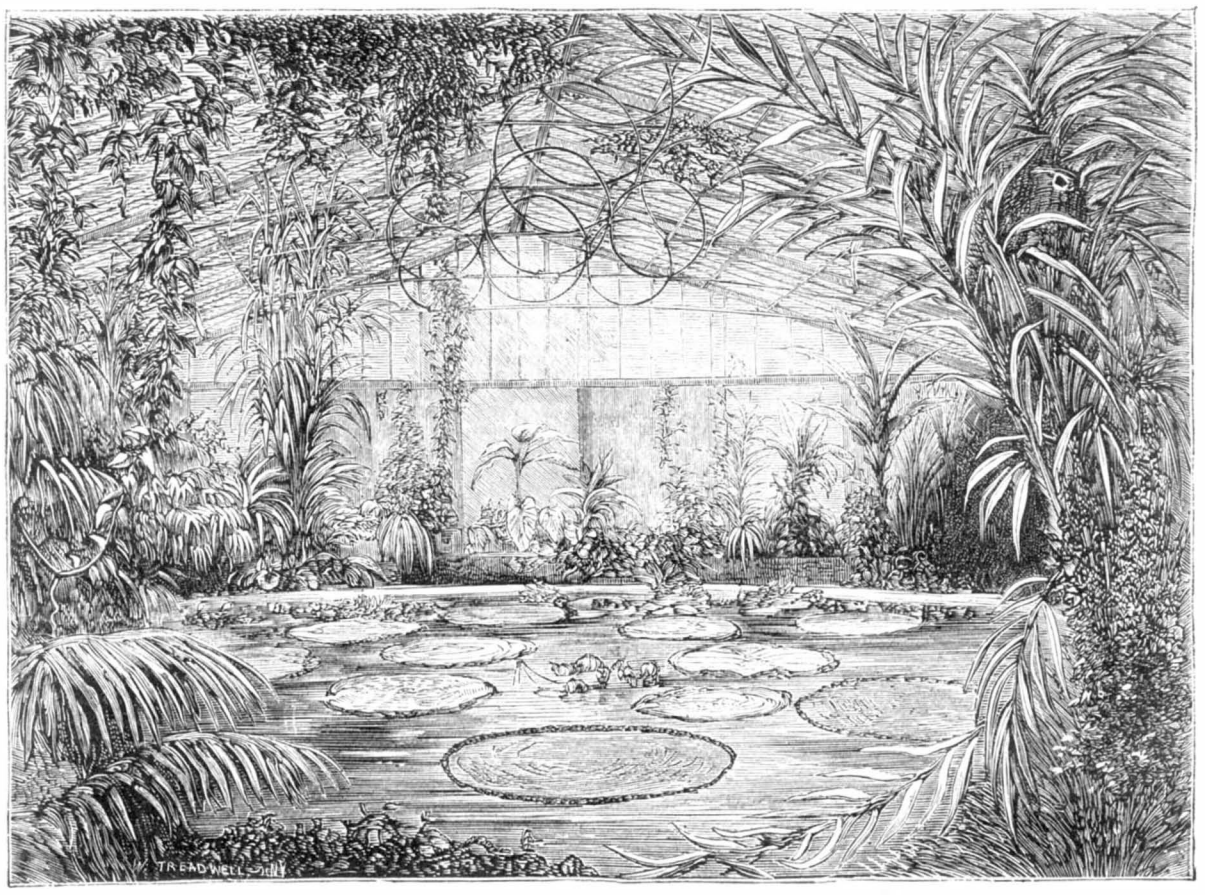
THE VICTORIA REGIA HOUSE AT CHATSWORTH, ENG.

The celebrated residence of the Duke of Devonshire, at Chatsworth, owes its renown to the grand scale on which the science of horticulture is there carried on. The credit of the formation of the gardens, as they at present exist, is due to Mr., afterwards Sir Joseph, Paxton, whose ingenious system of ridge and furrow glasshouse building, first designed by him for the Duke's hot houses, was carried out on a very large scale in the structure for the Great Exhibition of 1851, which is now the Sydenham Crystal Palace. The vineries, pineries, strawberry beds, and vegetable gardens at Chatsworth are such as only the highest taste and skill, supplemented by great wealth, could organize and maintain.

We present herewith a view of the hot house in which the Victoria Regia, the superb water lily of the Amazons, is to be seen in its greatest luxuriance. The large tank, seen in the center, says *The Garden*, to which we are indebted for the illustration, contains another tank, 16 feet in diameter, and considerable deeper than the outer portion; this contains the soil in which the Victoria lily is planted. The walls of the tanks are built of brick, and the bottom is paved with stone; the tanks are lined with lead throughout, and the two inch hot water pipes which supply them are also made of lead.

While the plant is growing, a little wheel, in the form of an overshot mill wheel, is fixed near the edge of the tank, and continually kept in motion by a small jet of water from a tap immediately over it; thus the surface of the water is always rippled. The Victoria Regia, being an annual, dies in November, when the water in the tank is drained off, and the soil contained in the inner part removed. The lilies in the angular tanks, being also out of season, are, about the same time, mostly cleared away and stored in troughs filled with water in the cucumber house. The aquarium, thus stripped of its summer occupants, is filled in winter with large chrysanthemums for furnishing cut blooms. As the Victoria lily annually produces and ripens a good stock of seeds, these are preserved in vessels of water until sowing time comes round, which is generally about the middle of December, or between that and January. The plants are potted singly, and re-potted as they advance in growth, until they have attained sufficient strength, when the best plant is planted out in a heap of fresh soil. At Chatsworth this lily luxuriates better and flowers more freely than it does in any other place in England, the largest leaves in summer measuring as much as 7½ feet in diameter.



THE VICTORIA REGIA HOUSE AT CHATSWORTH. ENGLAND.

Nickeling.

BY S. P. SHARPLES, MASSACHUSETTS STATE ASSAYER.

In answer to numerous inquiries, I again give a brief description of the process of nickeling. The patent is still before the courts, and no decision has been reached in regard to it.

The double sulphate of nickel and ammonium, which is the salt that is generally used, may how be had in commerce almost pure. It is manufactured on a large scale by Joseph Wharton, of Camden, N. J., who controls the nickel market in this country. Cast nickel plates for anodes may be obtained from the same source. The anodes should considerably exceed in size the articles to be covered with nickel. Any common form of battery may be used. Three Daniell's or Smee's cells, or two Bunsen's, connected for intensity, will be found to be sufficient. The battery power must not be too strong, or the deposited nickel will be black. A strong solution of the sulphate is made and placed in any suitable vessel: a glazed stoneware pot answers very well if the articles to be covered are small. Across the top of this are placed two heavy copper wires, to one of which the articles to be covered are suspended, to the other the anode. The wire leading from the zinc of the battery must then be connected with the wire from which the articles are suspended, the other battery wire being connected with the anode.

In order to prepare the articles for coating, they must be well cleaned by first scrubbing them with caustic soda or potash, to remove any grease, and then dipping them for an instant in *aqua regia* and afterwards washing thoroughly with water, taking care that the hand does not come in contact with any part of them. This is accomplished by fastening a flexible copper wire around them, and handling them by means of it. The wire serves afterwards to suspend them in the bath.

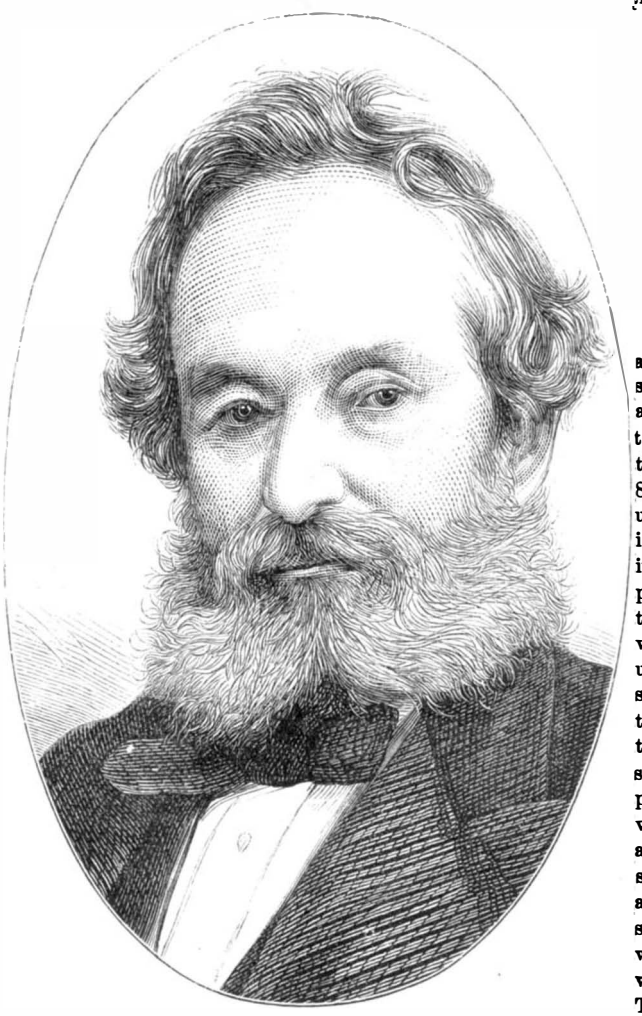
If the articles are made of iron or steel, they must be first covered with a thin coat of copper. This is best done by the cyanide bath, which is prepared by dissolving precipitated oxide of copper in cyanide of potassium. A copper plate is used as an anode. After they are removed from the copper bath, they must be washed quickly with water and placed in the nickel bath; if allowed to dry or become tarnished, the nickel will not adhere.

Great care must be used through the whole process to keep all grease, dust, or other dirt from the articles to be covered, or else the result will be unsatisfactory. The whole process is one of the most difficult that is used in the arts, it being far easier to gild, plate, or copper an article than to nickel it; but if due care be taken, the results will amply pay for the trouble.—*Boston Journal of Chemistry.*

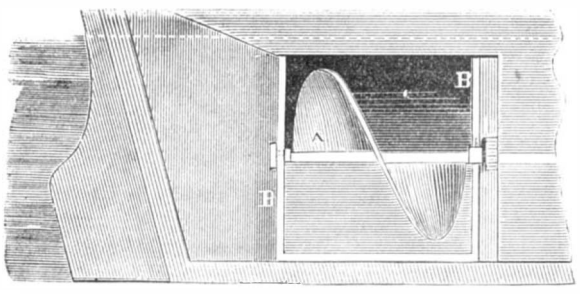
SIR FRANCIS PETTIT SMITH.

Sir Francis Pettit Smith, an inventor whose celebrity in connection with the development of screw propulsion and its introduction into steam navigation is worldwide, recently died in England. We publish herewith a portrait of this eminent man.

Like many others to whom mankind is indebted for great inventions, he began life as a farmer, a calling which gave little promise of leading him to the conceptions which have



terminated in such priceless results. Possessed of a strong taste for mechanics, however, he soon abandoned agricultural pursuits to prosecute his favored study, and to carry on investigations and experiments in the subject which, from an early date, engrossed almost his entire thoughts. In 1834, at twenty-six years of age, we find him trying models of boats propelled by a screw and driven by powerful springs, and a year later exhibiting his plans in London, and seeking to convince others of their feasibility. From this period dates his public—if so we may term it—life, and contemporary journals now come to our aid in preparing this brief account of his labors. An old volume of the English *Mechanics' Magazine* is before us, and in its pages, now yellow with time, we find the reports of the earliest trials of the then novel mode of propulsion. Let us here remark that to the subject of our sketch is not due the credit of inventing the screw propeller; for as early as 1727, one Duquet, a Frenchman, proposed to force a "vessel up a river against the current by means of screws," and there are no less than fifteen mentions of applications of the principle—including two American patents for "screw propelling wheels to boats," and for "a screw or spiral lever for propelling vessels"—of prior date to the patent of Sir Francis; but to him, however, is to be ascribed the honor of first successfully demonstrating the practicability of the plan by devising a means and proving its value by direct experiment. The patent of Sir Francis is dated May 31, 1836, and it claims "a propeller, whether arranged singly in an open space in the dead wood, one on each side of the same, or more forward or more aft, higher up or lower down, completely or partially immersed." This was afterwards modified to make the screw of a single thread, a double thread, or of a thread of two turns, located singly in the center of the dead wood. On obtaining his letters, Sir Francis constructed a small steamboat of 10 tuns burden and six horse engine power, which he tried on the Paddington canal and on the Thames river with satisfactory results. During the following year she was put to sea, visiting points along the coast, and proving so completely successful that the Lords of the Admiralty directed further investigation into the invention, with a view of its introduction into the Royal Navy. Mr. Smith, aided by the Messrs. Rennie, engineers, then constructed a larger vessel, the Archimedes, a ship 155 feet long, of 237 tuns burden, and ninety horse power engines. The old periodicals before us contain numerous reports of this boat's performances, but there is a vein of dubiousness running through all the comments, that shows that the editor had little faith in the new fangled idea.



In 1839, however, he published a cut of the new vessel, a portion of which, showing the screw, we reproduce in facsimile. A, the blade of the propeller, forms an angle of about 40° with the shaft, and is made of iron plates. B is the frame in the dead wood of the vessel. The diameters of the screws used were 5 and 7 feet, and their lengths 7½ and 8 feet. It is curious, at this day, to read the remarks made upon the invention, in the article accompanying the engraving: "It has, altogether, great defects, which will prevent it from competing with the common paddle wheel, both in point of economy and of power:" "Useless, on account of the impracticability of keeping the whole screw under water:" "Engines and boilers will require the whole space up to the deck:" are examples in point. In a number of the same journal, of later date, is a most elaborate treatise on the subject, in which the author completely demonstrates the screw to be absolutely worthless; but despite this wholesale condemnation, the inventor calmly continued his experiments, built more vessels, and ended by proving his device so unequivocal a success that the Government began to apply it to naval ships. In 1842 H. M. S. Rattler was constructed, and a series of investigations made by Mr. Smith and Mr. Brunel to determine the best proportions of the screw; while, at the same time, another craft, the Alecto, was built on precisely the same lines as the Rattler, but with paddle wheels, in order to institute a comparative test. The superiority of the Rattler was so evident that the Admiralty at once ordered the Queen's yacht Fairy and twenty other vessels to be built for screw propulsion under Mr. Smith's direction.

The subsequent rise and progress of the system is within the memory of most of our readers. Before 1850, when Sir Francis retired from the business, more than a hundred

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vessels of all classes were built or in process of construction. At the present day, by far the majority of steamships in the world are propellers, and but a single side-wheel vessel is to be found among the great lines which ply across the Atlantic.

Some three years ago Mr. Smith was knighted, in recognition of his eminent services; and for a considerable period he held the post of Curator of the Patent Office Museum at South Kensington, England. The Admiralty purchased his patent right for $100,000.

New Imitation of Silver.

In the SCIENTIFIC AMERICAN of January 24, is described a patented process for obtaining a metallic alloy which resembles silver better than any substance yet known, with respect to color, specific gravity, malleability, ductility, sound and other characteristics. The new alloy is a compound of copper, nickel, tin, zinc, cobalt and iron. If this new metal is as perfect as represented, there may be a good chance for coin counterfeiters, etc., to start a flourishing business in making trade dollars, halves, quarters, etc. We had a call this week from a distinguished personage in this city, whose authority and influence is well known to members of our community. He thinks the metal referred to should not be made, and has therefore issued the following

PROCLAMATION:

Fearing that the granting of a patent for the imitation of silver, such as mentioned in the SCIENTIFIC AMERICAN of the 24th day of January, 1874, may lead to endless frauds in the silver currency of the country, *now, therefore*, we, Norton I, *Dei Gratia* Emperor of the United States and Protector of Mexico, do hereby command the Commissioner of Patents to cancel the said patent, and declare the manufacture of such a metal a penal offence.

NORTON I.

Given in San Francisco, Cal., this 3d day of February, 1874.—*Mining and Scientific Press.*

Dr. Hall and the Scientific American.

It is not often that we copy what others say of us, but the following comes from one whose opinions are so generally respected that we select it from a multitude of other testimonials, and give it place:

"SCIENTIFIC AMERICAN. Weekly. $3 a year. Now in its 30th year. It is one of the best conducted newspapers in the country, and in its line it has not an equal in ability in the world. It is not only adapted to the wants of mechanics, inventors, and scholars, but, as a family paper, giving most valuable information of a domestic character and about home life, it merits very general patronage. Moral, reliable, and self-respecting."—*Hall's Journal of Health.*

REPORTS OF THE FRANKLIN INSTITUTE COMMITTEE ON THE MODE OF DETERMINING THE HORSE POWER STEAM BOILERS.—As may be learned from our advertising columns, the reports of this committee, which contain the results of much research, of value to engineers. are now printed in pamphlet form and for sale at the Institute.

IMPORTANCE OF ADVERTISING.

The value of advertising is so well understood by old established business firms that a hint to them is unnecessary; but to persons establishing a new business, or having for sale a new article, or wishing to sell a patent, or find a manufacturer to work it: upon such a class, we would impress the importance of advertising. The next thing to be considered is the medium through which to do it.

In this matter, discretion is to be used at first; but experience will soon determine that papers or magazines having the largest circulation, among the class of persons most likely to be interested in the article for sale, will be the cheapest, and bring the quickest returns. To the manufacturer of all kinds of machinery, and to the vendors of any new article in the mechanical line, we believe there is no other source from which the advertiser can get as speedy returns as through the advertising columns of the SCIENTIFIC AMERICAN.

We do not make these suggestions merely to increase our advertising patronage, but to direct persons how to increase their own business.

The SCIENTIFIC AMERICAN has a circulation of more than 42,000 copies per week, which is probably greater than the combined circulation of all the other papers of its kind published in the world.

PATENT OFFICE DECISIONS.

United States Circuit Court---District of Massachusetts.

PATENT MARINE PAINT.—JAMES G. TARR *et al. vs.* CHARLES E. FOLSOM.

[In Equity.—Before Shepley, Judge.—Decided January 1, 1874.]

In an original patent for a paint for ships' bottoms, "copper ore in the form of an oxide" was specified as one of the ingredients, and a preference was expressed for "the oxide of copper made from pyritous friable ores;" a reissue of the patent was sustained, although it mentioned that such ores contained other substances which retarded the solution of the oxide of copper, and described that ingredient as made by roasting the pyritous friable ores exposed to air, the article thus produced being well known in the arts.

Proof that the samples deposited in the Patent Office with the original application do not correspond with the ingredients specified in the reissue will not impair its validity; whether an applicant has complied with the the requisites for obtaining a patent is for the Commissioner to determine, and the court will not revise his action.

If a paint has been before known including as essential ingredients oxide of copper and antimony mixed with copper to harden the whole, it is a patentable novelty to dispense with the antimony and use the oxide of copper without it, and to add earthy ingredients which retard the solution of the copper.

A suggestion contained in a prior patent for purifying oil of turpentine and naphtha, and dissolving in them india rubber and the like, that such solutions may be combined with the oxides or salts of copper, and applied to ships' bottoms, which is impracticable, will not affect the validity of a patent for a paint composed of tar, naphtha, and oxide of copper.

A paint containing oxide of copper and oxide of iron, to retard the solution of the copper, is an infringement of a patent for a paint prepared from a natural ore containing oxide of copper and earthy matters, which retard its solution.

This is a bill in equity for an alleged infringement of letters patent granted to defendants on the third day of November, 1868, and reissued on the seventeenth day of October, 1871, in two divisions, for an improved paint for ships' bottoms, or marine paint.

Decree for injunction as against division B of complainants' patent, and for an account, as prayed for in the bill.

Brown & Holmes, for complainants.

T. W. Clarke, for defendant.

Supreme Court of the United States.

PATENT WAGON REACH.—PHILIP HICKS, APPELLANT, *vs.* GEORGE KELSEY.

[Appeal from the Circuit Court of the United States for the Northern District of Illinois.—October Term, 1873.]

A wagon reach of wood strengthened by straps of iron on each side, and curved to allow the fore wheels to pass under, being well known, it required no invention to dispense with the wood and bolt the straps together, or to forge them in one piece; and a patent for a reach thus made was declared void for want of novelty in the invention.

Mr. Justice Bradley delivered the opinion of the court:

Hicks, the appellant in this case, obtained a patent for an improved wagon reach, and filed a bill against the defendant charging infringement and praying the usual relief. The defendant answered, denying the novelty of the alleged invention, and also denying infringement.

The reach claimed as new had an upward bend or curve to allow the forward wheels to turn under it in turning the wagon. It was admitted that reaches of this sort had long been used, made of wood strengthened by straps of iron attached to each side of the reach. The supposed improvement of the plaintiff consisted in leaving out the wood in the curve and bolting the iron straps together, whereby the curve became all iron and less bulky, but in all other respects having the same shape and performing the same office as before. Instead of being bolted together, the straps might be welded so as to make the curve consist of solid iron.

The question is whether this mere change of material, making the curve of iron instead of wood and iron, was a sufficient change to constitute invention, the purpose being the same—namely, to turn the wheel under the body of the wagon—the means of accomplishing it being the same—namely, by a curved reach—and the form of the reach and mode of operation being the same? It is certainly difficult to bring the case within any recognized rule of novelty by which the patent can be sustained. The use of one material instead of another in constructing a known machine is, in most cases, so obviously a matter of mere mechanical judgment, and not of invention, that it cannot be called an invention, unless some new and useful result, an increase of efficiency, or a decided saving in the operation, is clearly attained. Some evidence was given to show that the wagon reach of the plaintiff is a better reach, requiring less repair, and having greater solidity than the wooden reach. But this is not sufficient to bring the case out of the category of more or less excellence of construction. The machine is the same. Ax helves made of hickory may be more durable and more cheap in the end than those made of beech or pine; but the first application of hickory to the purpose would not be, therefore, patentable.

Cases have frequently arisen in which substantially the question now presented has been discussed. Perhaps, however, none can be cited more directly in point than that of Hotchkiss *vs.* Greenwood, (11 Howard, 248,) in which it was held that the substitution of porcelain for metal in making door knobs was not patentable, though the new material was better adapted to the purpose and made a better and cheaper knob. So, in a case at the circuit, referred to by Justice Nelson in the last named case, the substitution of wood for bone as the basis of a button covered with tin was held not patentable. (11 How., 266.)

In Crane *vs.* Price (Webster's Pat. Ca., 409,) it is true, the use of anthracite instead of bituminous coal with the hot blast in smelting iron ore was held to be a good invention, inasmuch as it produced a better article of iron at a less expense. But that was a process of manufacture, and in such processes a different article replacing another article in the combination often produces different results. The latter case is more analogous to the cases of compositions of matter than it is to those of machinery; and in compositions of matter a different ingredient changes the identity of the compound, whereas an iron bar in place of a wooden one, and subserving the same purpose, does not change the identity of a machine. (See Curtis on Patents, 3d ed., secs. 70-73.)

But the plaintiff's counsel alleges that his invention does not consist of the mere substitution of a particular material which had been previously used for the same purpose in the same way, but consists in the production of a certain described article by a certain described mechanical process, which process, viewed as a whole, is new and useful; and then he describes what he supposes to be such new mechanical process. This is his argument; but the facts do not bear out such a view of the case. They are precisely and only as we have before stated them.

In our judgment the patent in this case is void for want of novelty in the alleged invention. The decree, therefore, must be affirmed; and it is affirmed accordingly.

Supreme Court of the United States.

PATENT SAWING MACHINE.—EUGENE S. EUNSON AND JACOB LAGOWITZ, PLAINTIFFS IN ERROR, *vs.* NORMAN W. DODGE, T. BENJAMIN MEIGS, AND WILLIAM E. DODGE.

[In error to the Circuit Court of the United States for the Southern District of New York.—October Term, 1873.]

If one who purchases a patented article from those who have no authority to sell it obtains an assignment for his territory of the patent for the original term, he is not liable for using the article after the patent is extended.

Mr. Justice Hunt delivered the opinion of the court.

This is an appeal from the Circuit Court of the United States for the Southern District of New York.

The bill alleges that Myers & Eunson were the original and first inventors of a sawing machine; that letters patent were granted to them therefor on the 23d day of May, 1854; that the pateat was extended for seven years from May 23, 1868; that the complainants are the owners of the letters patent for the State of New Jersey; that the defendants have infringed the patent by the use of a sawing machine at Jersey City, Hudson county, New Jersey, during the extended time of the patent, without right or licence; that the complainants have thereby suffered great damage, and the defendants have made large profits.

The answer of the defendants admits the grant and extension of the patent; admits that the defendants use a sawing machine containing the patented devices and combinations; alleges that the defendants are the successors in business of the firm of Dodge & Co.; that Dodge & Co. bought the machine in question in 1865 from the Huntington Machine Works; that Dodge & Co. subsequently purchased all the right of the patentees in the *original* term of the patent for Hudson county, New Jersey, and used said machine in said county till January, 1869, when the business passed into the hands of the defendants, who have continued to use said machine ever since; and insists that, having owned the right for Hudson county, New Jersey, under the original term, they are protected, by virtue of the acts of Congress, in the use of the same machine during the extended term.

The agreed statement of facts admits that in 1865 the predecessors of the defendants bought of the Huntington Machine Works a machine which infringed the complainants' patent, and that the company selling to them had no right or licence to build or sell the same; that, upon being notified of the infringement, the purchasers bought of one Schureman, who was an assignee of the patentees, the right under the patent for Hudson county for the original term of the patent; that the defendants used the machine in that county during the original term, and have continued there to use it during the extended term. The judge at the circuit held that they had the right to use the machine during the extended term, and dismissed the complaint. It is from this decree that the complainants take their appeal.

The 18th section of the patent act of 1836 ends with these words, namely:

And the benefit of such renewal shall extend to assignees and grantees of the right to use the thing patented, to the extent of their respective interests therein. (5 Stat., 125.)

This court has decided many times that this section gives to an assignee of the patent during the original term the right to continue, during the extended term, the use of a machine used by him during the original term. (Wilson *vs.* Rousseau, 4 How., 646; Bloomer *vs.* McQuean, 14 How., 539; Chaffee *vs.* Boston B. Co., 22 How., 217; Bloomer *vs.* Millinger, 1 Wall., 340.)

The complainants seek to distinguish the present from the cases cited in this manner: In those instances, they say, the machines were lawfully constructed by the patentees, or purchased from the patentees or their assignees; whereas the machine purchased by the defendants in this case was not a lawfully made machine, and was never purchased from the owner of the patent. We are of the opinion that this distinction is not well taken. That the purchase of the machine was made from an infringer, and a wrong done, is true. When informed of the offence, the purchaser at once corrected the evil by purchasing the entire right of the patentees for the county where his machine was then used, and where it has since been used. This was equivalent to an original lawful purchase or manufacture of the machine. By the purchase of the right for Hudson county, and from the moment of that purchase, the defendants held and used the machine by a lawful title, as perfect and complete against the patentees as if the original purchase had been from them. They then became, in the language of the statute, "grantees of the right to use the thing patented," so continued to the time of the expiration of the original patent, and the right so to use was, in the further language of the statute, "the extent of their interest therein."

We are of the opinion that the decree of the Circuit Court was correct, and that it should be affirmed.

NEW BOOKS AND PUBLICATIONS.

PHYSICAL GEOGRAPHY. By John Young, M.D., F.G.S., F.R.C.S.E., etc. $1.50. New York: G. P. Putnam's Sons, corner of Fourth avenue & 23d street.

This book will prove a welcome addition to educational literature, from the fact that it collates, in compact form, the most recent knowledge regarding the physical condition of our planet. In discussing formation, the writer draws largely upon the teachings of geology, and in some degree upon those of astronomy, in every instance in which these sciences border upon his subject. Ethnological and archæological information of value is also incorporated, so that the work, as a whole, is a comprehensive and excellent treatise upon a study which may almost be considered a distinct science. A few illustrations are interspersed, and a copious index is added. As its title indicates, the book is a reprint, and is designed by the publishers as a portion of their Advanced Science Series.

THE AMERICAN HISTORICAL RECORD, AND REPERTORY OF Notes and Queries concerning the History and Antiquities of America, etc. Edited by Benson J. Lossing, LL.D. $4 per annum. Philadelphia: John E. Potter & Co., 617 Sansom street.

This valuable publication is still chiefly occupied in searching out and preserving information concerning the early history of our country, a work which is vitally necessary to our future historians, and which could scarcely be in abler hands than those of the eminent scholar and archæologist who edits it. Among the many publications which reach us, there is none that is more worthy of close and attentive reading.

THE PORTABLE ATLAS, consisting of Sixteen Maps. Constructed and Engraved by John Bartholomew, F.R.G.S. Price $1. New York: G. P. Putnam's Sons, corner of Fourth avenue & 23d street.

This is a reprint of an English work, and hence the majority of the maps relate to countries under British rule. The plates, however, are finely executed and printed, and are valuable in that they show the results of recent explorations. This is especially the case in the map of Africa, in which the localities now inseparable from the name of Livingstone are accurately laid down. The book, as its title indicates, is in portable quarto form.

SURCHARGED AND RETAINING WALLS. By James S. Tate, C. E. Also, TREATISE ON THE COMPOUND STEAM ENGINE. By John Turnbull, Jr. Nos. 7 and 8 of Science Series. Each 50 cents. New York: D. Van Nostrand, 23 Murray and 27 Warren streets.

These useful little publications deserve the attention of practical men The book on the compound steam engine contains much valuable information on a subject which now attracts universal attention.

THE BRITISH JOURNAL PHOTOGRAPHIC ALMANAC, AND PHOTOGRAPHER'S DAILY COMPANION FOR 1874. Edited by J. T. Taylor. London: H. Greenwood. New York: E. & H. T. Anthony & Co., 591 Broadway.

A handy book of reference, excellently gotten up, and issued by the conductors of the *British Journal of Photography*, a publication deservedly well known to our readers.

THE BIRTH OF CHEMISTRY. By G. F. Rodwell, F.R.A.S., F.C.S. Price $1.25. New York: Macmillan & Co., 38 Bleecker Street.

This little work is a valuable *resume* of all that is known of the origin and history of the chief of the sciences. Mr. Rodwell's contributions to contemporary knowledge all bear the mark of much thought and originality, and deserve to be produced in a form more permanent than the pages of a weekly periodical. The publishers, therefore, have added this interesting book to the list of their *Nature Series*.

EVERY SATURDAY contains the cream of the English literary periodicals, and should be in the hands of every lover of light and entertaining literature. Two excellent serials, taken from advance sheets, are now in progress—one by Thomas Hardy, a rising English novelist to whom critics have accorded a position little inferior to that of George Eliot. A new editorial department, occupying the last two pages of each number, has been added; a change which cannot fail to render the journal even more acceptable, from the fact of its thus assuming an individuality which could not attain while remaining merely a collection of reprints. The publishers, Messrs. Hurd & Houghton, 13 Astor Place, New York, offer *Every Saturday* and the *Atlantic Monthly* together for $8 per annum, or *Every Saturday*, singly, for $5.

Inventions Patented in England by Americans.

[Compiled from the Commissioners of Patents' Journal.]

From January 2 to January 29, 1874, inclusive.

BOTTLE STOPPER.—N. Thompson (of Brooklyn, N. Y.), London, England.
COMPOUND STEAM ENGINE.—T. L. Jones, Natchez, Miss.
CUTTING PIPE, ETC.—F. W. Allin, New York city.
ELECTRIC ANNUNCIATOR.—L. Finger, Boston, Mass.
ELECTRIC MACHINE.—H. J. Smith, Boston, Mass.
ELECTRIC TELEGRAPH.—W. E. Sawyer, Washington, D. C.
ELECTRIC TELEGRAPH.—J. B. Stearns (Boston, Mass.), London, Eng., *et al*
HOIST.—W. Hart, Philadelphia, Pa.
INDICATOR.—S. D. Tillmann, Jersey city, N. J.
KALEIDOSCOPE.—J. Collicott, Boston, Mass.
LAMP.—C. H. Leighton, Lowell, Mass.
LAMP.—T. S. Williams *et al.*, Boston, Mass.
METAL PAIL, ETC.—H. W. Shepard, Brooklyn, N. Y., *et al.*
MODE OF COMBUSTION.—D. T. Casement, Painesville, Ohio.
PROPELLER.—J. S. Morton, Philadelphia, Pa.
REDUCING FURNACE.—J. Wilson, Dover, N. J.
REGENERATIVE FURNACE.—T. S. Blair, Pittsburgh, Pa.
RIBBON LOOM, ETC.—E. P. Chapin, Providence, R. I.
ROTARY ENGINE AND PUMP.—W. R. Manley, New York city.
SEWING MACHINE CABINET.—H. R. Tracy *et al.*, New York city.
TOY.—W. A. P. La Grove, New York city.

Recent American and Foreign Patents.

Improved Pneumatic Station Indicator.

James P. Kealey and Joseph Rigney, Bridgeport, Conn.—A case contains a roller and a chain of name plates. The roller is turned the width of one face at each station to present the plates having names of the stations in front of the sight opening, and the name plate chain cannot be carried beyond the point of showing the name of the last station on the route, in case the car should be run beyond its route on another section or division, and it is held ready for running back on its own route. Springs are employed to allow the roller to turn in case the mechanism for turning it is kept in operation after passing beyond the terminal station, and to pull the roller back each time. This will be found desirable in case the car should get coupled in a train for a road or station to which it does not belong, with cars having annunciators for that road, so that its annunciators would of necessity be coupled with the others, and so have to be worked that the others may be.

Improved Finger Bar for Harvesters.

Victor N. Collins, Dixon, Cal.—The bar is formed with a top sloping backward; also, with a flange on the front upper edge, and with flanges on the rear side. The fingers are formed with a wide base to bear against the side of the bar, and are firmly secured so that they cannot turn out of place. The top plate for the bar is made of a wide thin strip of iron folded back on the under side from the lower edge to the side of the bar, forming the top guide for the carrier; and said plate is bolted to the finger bar. There is an upward inclination of the top plate at one end to cover the end of the endless carrier as it rises up over the pulley at that end on which the carrier works. A spring is attached to said plate at the other end to guide said grain carrier down under the upper guide.

Improved Car Coupling.

William B. Morgan, Shelby City, Ky., and Henry D. Wallen, Jr., Grand Rapids, Mich.—The forward ends or faces of the bumper heads are rounded off; they are made oblong or elliptical in their general form. In the face of the bumper heads is formed a high and narrow opening, with straight ends and curved or concaved sides. The coupling hook has in one end an eye to receive a bolt, which passes through vertical slots in the sides of the bumper heads to pivot the said hook to said bumper heads. The parts of the bolts that pass through the slots of the said bumper heads are flattened, so that the said bolts cannot turn to work the nuts screwed upon them loose. The bolts may be raised and lowered, to adjust the position of the hook to the hight of the adjacent car. In the forward lower part of the mouth of the bumper heads are formed or secured inclined plates for the beveled forward end of the hook to strike against and slide up as the cars are run together.

Improved Carriage Seat.

John A. Althouse, New Harmony, Ind.—This invention consists in making a seat adjustable so as to fit wagons of different widths, and also in the manner of fastening the seat to the sides of the box, and in the arrangement of the seat springs. The seat consists of a piece of board provided with bed pieces, which are rabbeted, so that, when they rest upon the top edges of the wagon box, the joints are covered by flanges. The springs are made of sheet steel, and are secured to adjusting plates attached to the seat by screws, which pass through the slots. These slots allow the plates springs, etc., to be moved outward or inward, as may be required, for adapting the seat to wagon boxes of any ordinary width. The ends of the springs are attached to the bed pieces. Clampingscrew hooks pass through the bed pieces and hook to the inner sides of the side boards, and are tightened thereto by means of the lever nuts on the outside.

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Improved Egg Carrier.

Wendelin Weis, St. Paul, Minn.—The object of this invention is to construct egg carriers in such a manner that not only the eggs are securely packed in the cells, but also the cover connected to the case, in such a manner that it may be easily placed on or taken off without breaking or splitting the same. In the case of the egg carrier are arranged, in tiers placed one above the other, the cells for the eggs, which are formed of parallel strips of one series, and interlacing strips of the other series vertically to them. The first strips are provided with slits cut from each edge toward the center under right angles to it, leaving the central part undivided. The second strips are provided with a central slit, of the same width as the uncut part of the first strips, together with a narrow V shaped aperture, stamped out, through which the first strips are, by bending them, introduced and adjusted, so as to interlock and form a tier of cells, which may be easily lifted from the case without detaching from each other. The top of the case is provided with two side strips, which slip along the side of the case and rest on the side strips of the same. The top is connected to the case by merely slipping springs down, till they interlock with metallic bands, forming a firm and safe attachment of top and case, and obtaining a permanent egg carrier without injury to the top by nails, screws, etc.

Improved One Wheeled Three Horse Riding Plow.

Robert C. Airey, Highland, Ill.—The short axle may be adjusted to set the wheel, and at an angle to the beam; and by suitable means the line of draft, and consequently the pitch of the plow, may be conveniently regulated. The plow beam is hinged to the cross beam, so that the plow may be swung out and in, as desired. The forward end of the beam may be raised and lowered to cause the plow to run out of and into the ground, as desired, and the seat can be conveniently adjusted, as the weight of the driver may require.

Improved Buckle.

George H. Lefevre, Winneconne, Wis., assignor of one half his right to Joshua S. Judson, Austin, Minn.—This buckle is constructed with a metallic loop, made to admit two thicknesses of leather strap. The end of the strap is provided with one or more holes to receive pins. The other end of the strap is passed through the buckle and then through the loop, thus crowding the end of the strap upon the pins, and holding it there. The buckle is readily detached by reversing this operation. With this loop a broken strap can be attached to a buckle with ease.

Improved Fruit Jar.

Thomas Hale and Henry Hale, Wales, N. Y.—The upper part of the can is made in the form of a wrench section, so that such an instrument can be fitted over it. On the cap, which screws to the neck of the can in the usual manner, is formed a bail through which two holes are made on opposite sides. A rod is placed through these apertures, and by it, as a lever, the cap is easily unscrewed or secured, a wrench fitting over the section holding the vessel from turning.

Improved Needle Sharpener for Sewing Machines.

John L. Woodruff, Easton, Pa.—This invention consists of a curved arm which is attached by a set screw to the sewing machine table, and which carries at its upper end a rubber wheel, connected to the fly wheel of the machine, through which the needle is passed to be sharpened by a small whetstone.

Improved Register Valve for Water Heaters.

George H. Tucker, Milwaukee, Wis., assignor to himself and James C. Ricketson, of same place.—This invention relates to valve mechanism for regulating the admission of water to a boiler feeder. The water is supplied to the heater through a pipe connecting with a shell. Said shell is essentially globular in form, and has a diaphragm joining its diagonally opposite sides, and forming, intermediately, a flat seat for a disk valve. The valve seat has openings, corresponding in shape, size, and number, with those in the valve. A spiral spring encircles the stem, bears on the valve, and is arranged or fitted in a circular recess in the plug, at its opposite end. A screw passes through the side of the shell, and bears against the short guide stem of the valve, to prevent the pressure of water in the pipe above from holding the valve. The means of operating the valve is a float working in a tank which communicates with the heater. To relieve the float of undue friction, rollers are employed. The connection between float and valve is by extension rod and arm, the latter being fixed to the valve stem. When the water rises or falls in the heater, it rises or falls correspondingly in the tank. The float will have a like and simultaneous movement, and hence the valve will be turned one way or the other, as required, to admit or shut off the water.

Improved Lever Motor.

John Stone, Millgrove, Mo.—This invention relates to imparting mechanical power to a drive shaft through the pendulum movement, and consists in the mode of combining the pendulum with the crank pitman and an actuating lever.

Improved Fountain Pen.

William E. Thomas, Queenstown, Md.—This invention relates to that class of pens which are provided with a tubular handle or barrel designed to serve as an ink reservoir; and it has for its object to improve the construction of said pens, so as to render the same more convenient in use and effective in operation than others heretofore constructed.

Improved Water Meter.

John Waterhouse, Chicago, Ill.—This invention relates to apparatus designed for measuring water from service pipes as it is delivered to the consumer. The water from the induction pipe runs into and fills one compartment, forcing the air contained therein through an air pipe into the other compartment, and this compressed air forces the water up through the eduction as it is being used. When the water in one compartment descends to a certain depth, a float will follow and pull the long arm of a lever outward, which releases a short arm, and allow a weight to fall. A the same time, a weight in the other compartment, which is submerged in water ascends and catches on the short end of the lever, which operation changes the flow of the water. A small rod is fastened in the center of the pivot tube, whence it passes through the front of the meter in a watertight packing, and terminates in a suitable device for connecting with any approved registering apparatus.

Improved Suspender.

Franklin O. Painter, Middletown, Ct.—The button straps and the shoulder straps are pivoted to a pivot piece of sheet metal, their ends being provided with a metallic plate, so that they readily turn on the pivot, and enable the shoulder straps to adjust themselves to the back of the wearer. The back button straps are also tipped with metallic plates attached by rivets, and these plates are pivoted to a back plate, so that they freely turn and adjust themselves to the position of the button on the pants. The front button straps are also provided with metallic plates, attached as heretofore described, and connected with the shoulder straps by a pivot. These straps render freely on the pivot, and are allowed to adjust themselves to the position of the front buttons of the pants. By connecting the pants with pivots, self-adjusting and easy suspenders are formed, less likely to twist in putting on.

Improved Gas Burner.

Cornelius Bogert and Henry Medlin, New York city.—This invention consists in arranging a plug centrally in the discharge aperture of a burner to cause the gas to pass out in thin vertical sheets, thereby exposing more surface to the air, becoming thus more completely oxydized, and therefore giving its maximum of illumination.

Improved Oil Tank.

Hazen Titus, St. Petersburgh, Pa., assignor to himself and Thomas Cushing, same place.—This invention has for its object to furnish oil tanks or reservoirs, so constructed that, should the oil take fire and an explosion take place, the exploded gases may escape freely, and the tank may be again tightly closed automatically, so as to smother the fire and thus save the oil. The invention consists in oil tanks provided with a number of openings, closed with hinged covers, to allow the exploded gases to escape freely without injury to the tanks. The covers are so arranged that they will fall back by their own weight as soon as the pressure is removed, and lightly close the tank, smothering the fire and preventing the oil from being burned up.

Improved Dental Impression Cup.

George Shindler Fouke, Westminster, Md.—This invention is an improved cup for taking impressions for dental plates, so constructed as to allow direct manipulative pressure to be applied to the soft parts of the roof of the mouth after the ordinary pressure has been applied. By this means the dental plates, when cast or otherwise made, press upon the soft parts of the arch of the mouth, rather than upon the hard parts, thus distributing the pressure, and securing a better fit and a more effective atmospheric plate. The invention consists in an impression cup that is provided with a flexible lining on the inside, and with "cut-outs" or apertures that expose the ascending sides of the alveolar arch.

Improved Heating Range.

Isaac J. Baxter, Peekskill, N. Y.—This invention relates to cooking ranges, and consists in several improvements whereby it is contemplated to economize the fuel used in the warm seasons of the year and utilize the surplus heat necessarily generated at other seasons. This heat is employed in raising the temperature and comfortably warming other apartments of the house.

Improved Wash Boiler.

Hugh Ross, Plattsburg, N. Y.—This invention is an improved detachable steam washer, which may be placed and adjusted into any wash boiler, and combines the advantages of a steam cleaning and bleaching apparatus. It consists in a novel arrangement of hot water passages and side air chambers, together with valve connections for the circulation of the boiling water. By means of hinge connections of the sides and the bottom, the washer may easily be inserted into any form of boiler of sufficient size, the bottom being also provided with a central partition for producing the separate action of each half of the washer. The invention further consists in applying to the bottom of the washer a chamber or receptacle to hold the acids or other chemicals for removing stains or bleaching the clothes.

Improved Elevator.

Charles F. Stewart and Milton Stewart, Muncie, Ind.—This invention relates to apparatus for hoisting bricks to different parts of a building in process of erection, which may be adjusted to various hights and easily applied to the sides of the building. The supporting frame of the apparatus is made of timber, and the lower ends of its side pieces are pivoted to shoes of a strong lateral piece, which again turns by a central bolt in a stable base part of strong timber. The base part rests on the ground, and remains firmly in position thereon, while the main frame may be swung into any direction and inclination required. For the purpose of transporting the elevator from one place to another the base part and piece are brought under the frame, so that the whole takes up less space. The main frame is extended to different hights by the sliding frames, which are suitably guided and are of different widths, one being narrower than the other, the wider one forming the support and guide for the narrower. By a suitable arrangement of rollers and ropes connected with a crank, the extension frames are hoisted to the hight required by the state of the building. The buckets are of a size large enough to take up one brick at a time, and are attached to an endless belt which passes over drums which are rotated. The bricks are deposited by the buckets in a chute which is inclined, down which they slide to the point where they are needed.

Improved Automatic Gate.

Jacob Grobb, Clinton, Can.—This gate is opened and closed by means of a cord, the ends of which are attached to a frame, the legs of which frame are confined to the ground, so that it may freely vibrate back and forth from an upright position. The top of the frame is connected with a sliding bar, which communicates with the fastening spring of the gate. When the gate is closed, the frame is inclined and stands at an angle with the surface of the ground of about thirty degrees. One end of the cord is attached to one leg of the frame, and then extends to an upright standard, where it passes through tackle blocks, and is extended to the standard, where it passes through three more tackle blocks, the same as before, from which blocks it is returned, and its other end is fastened to the other leg of the frame. When the cord is drawn, the frame will commence to rise, and in doing so will draw on the sliding bar, and thereby draw back the fastening spring and unfasten the gate. The frame will be drawn to an upright position when the gate is about half open, or at an angle with the road of about forty-five degrees. A continued pull opens the gate entirely, and inclines the frame in the opposite direction, and to about the same angle at which it stood when the gate was closed. The gate is closed by pulling the cord in an opposite direction, and the same effect is produced on the frame.

Improved Stock Feeder.

Ulyses Borel, Sue City, Mo.—A rectangular inclosure is designed to contain the hay or feed for the stock. Racks are applied to its outer side, below openings therein, which latter are closed by doors secured to the sides of the inclosure by staples and long links. The arrangement is such that when the doors are opened or lowered, they are supported on the racks by means of the links. The inner sides of the doors are thus turned outward, and form upward continuations of the racks, enlarging their capacity, and aiding in preventing the hay from falling over them on the ground.

Improved Burglar Alarm.

James J. Kane, Brooklyn, N. Y.—The bell is sounded by two hammers, one operated by an escapement and scape wheel, and the other by a connecting rod and crank, the crank and the scape wheel being turned by a wheel on a drum, containing a clock spring, which revolves said drum, when it is tripped and let free to turn by disengaging the lug on it from a stop lever. In order to cause this stop lever to trip the drum, a cam lever is connected with the window or door by a wire, to be moved one way by the pulling of the wire by the raising of the window or opening of the door. The cam lever is also connected with a spring pulling in the opposite way to trip the drum, by pulling the cam lever in that direction in case the wire is cut or detached from the door or window, and thus is provided an alarm which, it is claimed, cannot be evaded by cutting or detaching the wires, which has been done to other alarms of this character before opening the window or door, by means of instruments inserted in the cracks or by cutting away the casing. Suitable mechanism is arranged for tripping a hammer which, striking a cap, lights a fuse and a candle.

Improved Eaves Trough Support.

Thornton F. Morrison, Findley, O.—The roof bracket is a simple strap of metal, slotted at one end to receive the hanger, and perforated at the other to receive nails for fastening to the roof. The cross tie is made triangular in cross section. The hangers are made in two pieces, which are passed directly through the ties and then hooked under the bottom. The tie is made of two pieces, soldered together, and soldered to the eaves trough at each end. The upper end of the hanger passes through a slot, and is clasped around the edges of the bracket. When the hangers are attached to the ties and to the bracket in this manner they do not get loose, but form a sure and permanent support for the eaves trough.

Improved Car Coupling.

Franklin Thorpe, Sioux City, Iowa.—The cavity of the bumper is made in the form of a rectangular chamber, to the rear end of which are attached vertical plates, the upper sides of which are inclined or curved. In the forward part of this chamber is placed a block having two inclined plates projecting from its rear side. Upon the upper part of the forward, side of the block is formed a lip which, when pushed forward, supports the coupling pin. The lip projects over the inner end of the link, and holds said link in a horizontal position, so that it will enter the bumper of the adjacent car. A triangular bar, which crosses the chamber of the bumper, rests upon the inclined edges of the plates. To the bar is attached a rod, which passes down through a hole in the lower side of the bumper, so that a weight may be attached to it to draw the bar down with sufficient force to push the block forward when the coupling pin is withdrawn. By this construction, when the coupling pin is withdrawn, the bar pushes the block forward, so that the coupling pin may rest upon the lip. As the cars are run together, the entering link pushes the block back, allowing the coupling pin to drop through the link, coupling the cars.

Improved Stone Tool.

Thomas Joyce, Scranton, Pa.—The object of this invention is to construct miners' picks, drills and stonecutters' tools in general, with changeable points, so that a number of different bits may be alternately inserted, as required by the work, and thereby the number of tools lessened.

Improved Seed Planter.

William C. Pierce, Pushmataha, Ala., assignor to Knighton & Willis, same place.—This invention consists in a frame hinged to the beam of the planter, supported by a wheel at its lower end, and having a hopper pivoted to lugs attached to the frame, so that its forward end may move up and down. This motion is given to the hopper by a bar, which is struck by pins attached to a small wheel which engages with the supporting wheel first mentioned. The hopper slides upon an adjustable plate at its forward end, which has a hole formed through it, through which, when the hopper rises, the seed escapes and drops to the ground. The side of the hole through the plate is regulated by a slide, placed upon its rear side, which passes up through the slit in the cross bar. To the rear side of the slide, a little above the discharge hole, is attached a bar, which projects forward and downward, to prevent the seeds from scattering, and to guide them downward into the furrow. A gate slides up and down in grooves in the sides of the hopper, and in its lower edge is formed a notch, so that, by raising or lowering the gate, more or less seed may pass back and escape through the plate and slide. The forward end of the bottom of the hopper is cut away, and in the opening thus formed are placed two or more rods. Upon the bottom of the hopper is placed a false bottom, which is secured in place by a screw, which passes through a slot in the false bottom, and screws into the hopper bottom. With this construction for planting corn and other seeds in hills, the gate and plate are adjusted so that, by each revolution of the large wheel, the desired number of kernels may be dropped to the ground. For planting small seeds in drills, the space through which the seeds pass is partially closed by adjusting the plate, and a sufficient number of pins are placed in the larger wheel to keep the hopper in constant motion.

Improved Stock Feeder.

James M. Collins and William A. Miles, Atlanta, Mo.—To posts are attached slats to form the crib. The inner sides of the middle posts are grooved longitudinally to receive the edges of the board, to divide the crib into compartments, so that it may contain corn in the ear in one part and shelled corn or oats in another part. The floor of the crib, which rests upon strips, has an upwardly projecting flange attached to its outer edge to form a trough for the stock to eat from, into which the corn or other grain is admitted, through sliding doors which work up and down in guides attached to the posts. To the latter also are attached strips which support a floor made inclined, so that it may be self-cleaning, in the projecting parts of which, that form the bottom of the feed troughs, are formed trap doors, which may be opened and the refuse from said troughs pushed through conveniently to fall into the hog house beneath. Wheels and axles, are placed beneath the floor. Racks rest upon ledges attached to the crib, just above the sliding doors, and flare outward. To the middle parts of their upper edges are hooked braces, the inner ends of which are secured to the upper part of the crib.

Improved Mortising Tool.

Harbert K. Forbis, Danville, Ky., assignor to himself and John W. Proctor, same place.—The object of this invention is to provide an efficient tool for making mortises by boring into the wood, and at the same time cutting it out laterally. It consists of a cylindrical piece of steel having cutting edges along the sides formed by, say, two grooves extending from the cutting end along each side to the shank, and vanishing in the surface thereat. There are also cutting bits formed on the end by a deep notch made between said bits, which project on each side of the notch. The bits bore into the wood, while the cutting edges form the mortise laterally.

Improved Safety Attachment for Pockets.

Wiley Henry Cairns, Petrolia City, Pa.—This invention has for its object to furnish an improved guard for attachment to pocket books to prevent the possibility of their being drawn from the pocket without the owner's knowledge. Two short arms are pivoted to each other at one end, and also to the side of the pocket book. The other ends of the arms are pivoted to two bars at a little distance from their outer ends, which said outer ends project at the side edges of the pocket book, and have rubber blocks attached to them to prevent them from cutting or tearing the pocket. The other or inner ends of the bars are pivoted to each other and to the end of a short sliding bar which passes through a keeper attached to the side of the pocket book, and has a thumb piece formed upon or attached to its other or free end. By this construction, by drawing the sliding bar upward, the projecting ends of the bars will be drawn inward, allowing the pocket book to be readily removed from or inserted in the pocket. By suitable construction, when the sliding bar is released, a spring causes the rubber-tipped ends of the bars to project and rest against the pocket, and thus prevent the pocket book from being withdrawn from said pocket without the owner's knowledge.

Improved Truss Brideg.

John A. Patterson and Andrew J. Sprague, Toledo, O.—This invention consists of modifications and improvements in the construction of the Howe truss bridge. It is proposed to omit the end posts and pier panels commonly employed at the ends, mainly for making a finish thereat, and for a finish to apply metal façades of any ornamental construction, attaching them to the upper ends of the first diagonal braces, and the beam connecting the top chords. The angle blocks for the foot rests of the braces are made in the form of strong angle plates, united together at the proper angle for being at right angles to the braces which rest on them, with end plates and middle plates for strengthening them, projecting downward from the lower sides to rest on the floor timbers. These plates are slotted to straddle the coupling pin, which is suspended on vertical suspending rods, which pass through slots in the plates of the angle block. These plates terminate at the lower edges sufficiently higher than the plane of the connecting pin to allow the links of the lower chord to pass under them to the pin, whereon they are suspended. The floor timbers are suspended from these coupling pins by short rods and the foot plates, the rods having an eye in the upper end, through which the pins pass, and pass through the foot plates at the lower end, and receive a nut, by which to hold the plate. To connect the horizontal brace rods of the lower chord to the floor beams, the flat wrought iron plates with oblique holes are employed, and holes are made through the corners of the beams for the rods. In making the angle blocks, it is proposed to cast the under sides and the plates on metal chills, to make them sufficiently smooth and complete to be put in place without having to be finished.

Improved Permutation Lock.

Wilhelm Koch, Cincinnati, O.—For opening the lock, a dial knob is turned in one direction till the pin of a driving wheel engages the tongue of a first tumbler, the pin of the first tumbler the tongue of the second, and so on until all the tumblers are in motion. The dial plate is then set with the first letter selected to the index mark, carried thence in opposite direction to the second letter, and so on alternately in opposite directions till the tumblers are in position for admitting the fence of the fence lever. The driving wheel is then set so that a pendulum rests upon cross pins; then lifting, by a return motion of the knob, the pendulum lever and releasing the fence lever, which engages the driving wheel and rotates the bolt lever and bolt, bringing the recess of the face disk into position to receive the bolt of the safe door. The lock may be set to any combination of letters on the dial plate by placing the tumblers into their position, as described, by using, instead of the index mark, which is vertically above the dial plate, the side mark, which brings the recesses of the tumblers under the spring rings in position for the action of the wedge lever, and allows the entering of the wedge teeth and the changing of the tumblers to any desired combination of letters. The wedge lever is then withdrawn and the lock opened on the index mark.

Improved Self-Oiling Bolster.

John D. Wells, Jr., Putnam, Conn.—This invention consists of an oil chamber in the hub of the gear, which runs on the bolster and revolves the bobbin; there is a small passage from the bottom of the chamber to the hole through the wheel for the bolster; and a slot is made in the latter to the spindle, by which the oil supply is carried from said chamber and delivered to the bolster only while running. From the bolster the oil finds its way through the slot to the spindle, in a manner calculated to lubricate the parts efficiently, and at the same time economize the oil. The oil passage from the oil chamber to the bolster hole of the gear prevents the waste of oil while the machine is not running, in consequence of being so small that the oil only flow when the parts are in motion.

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Business and Personal.

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Wanted—Foreman in a first class Door and Sash Factory. A good opportunity for an experienced and well qualified man. None other need apply. References required. Address Box 1,500, Columbus, Ohio.

Estimates furnished for Machinery, Shafting, Pulleys, &c. Tully & Wilde, 20 Platt St., New York.

For Sale—One fourth interest in a Patent likely to repay $50,000 a year. Proposals will be received until May 1. Full particulars, including copy of letters patent and sample, sent on receipt of $3.50; same, without sample, 25 cts. Address L. E. de Waru, care of Thomas S. Wilkinson, Baltimore, Md.

Rue's "Little Giant" Injectors, Cheapest and Best Boiler Feeder in the market. W. L. Chase & Co., 93, 95, 97 Liberty Street, New York.

A Superior Printing Telegraph Instrument (the Selden Patent), for private and short lines—awarded the First Premium (a Silver Medal) at Cincinnati Exposition, 1871, for "Best Telegraph Instrument for private use"—is offered for sale by the Mercht's M'f'g and Construction Co., 50 Broad St., New York. P. O. Box 496.

Patent for Sale—The best burglar proof door lock in the world. F. Gyss, 196 Greene St., New York.

For the best Cockle Separator ever made, with capacity from 40 to 70 bushels per hour, address Balch & Giddings, Hingham, Wis.

What to Do in Case of Accident—Cuts, Bruises, Broken Bones, Burns, etc. A Book for Everybody. Free by mail for ten cents. Industrial Pub. Co., 176 Broadway, New York.

To Rent, at low rates, a Room with Power. Address Box 679, Birmingham, Conn.

Light Machinery—Articles in Iron or Brass, Model Work, &c. G. E. Parker, Newark, N. J.

Mining, Wrecking, Pumping, Drainage, or Irrigating Machinery, for sale or rent. See advertisement, Andrew's Patent, inside page.

Steam Boiler and Pipe Covering—Economy, Safety, and Durability. Saves from ten to twenty per cent. Chalmers Spence Company, foot East 9th St., N.Y.

By touching different buttons on the desk of the manager, he can communicate with any person in the establishment without leaving his seat. The Miniature Electric Telegraph—Splendid for offices, factories, shops, dwellings, etc. Price only $5, with battery, etc., complete for working. Made by F. C. Beach & Co., 260 Broadway, corner Warren St., New York. The Scientific American establishment, New York, is fitted with these instruments.

Woolen and Cotton Machinery of every description for Sale by Tully & Wilde, 20 Platt St., N.Y.

Steam Engines—Special Machinery, Shafting, Pulleys & Hangers. D. Frisbie & Co., N. Haven, Ct.

L. & J.W. Feuchtwanger, 55 Cedar St., N.Y., Manufacturers of Soluble Glass, Water Glass or Silicates of Soda and Potash in all forms and quantities.

Dean's Steam Pumps, for all purposes; Engines, Boilers, Iron and Wood Working Machinery of all descriptions. W. L. Chase & Co., 93, 95, 97 Liberty Street, New York.

Diamond Carbon, of all sizes and shapes, for drilling rock, sawing stone, and turning emery wheels; also Glaziers' Diamonds. J. Dickinson, 64 Nassau St. N.Y.

No inconvenience is ever felt in wearing the New Elastic Truss which retains the Rupture, night and day, till cured. Sold cheap by the Elastic Truss Co., 683 Broadway, New York.

"Superior to all others"—for all kinds of work—Limet & Co.'s French Files. They are better, forged, better cut, better tempered, and cheaper than English files. Send for Price-List. Homer Foot & Co. Sole agents, 20 Platt St., New York.

Price only three dollars—The Tom Thumb Electric Telegraph. A compact working Telegraph apparatus, for sending messages, making magnets, the electric light, giving alarms, and various other purposes. Can be put in operation by any lad. Includes battery, key and wires. Neatly packed and sent to all parts of the world on receipt of price. F. C. Beach & Co., 260 Broadway, cor. Warren St., New York.

Brown's Coalyard Quarry & Contractors' Apparatus for hoisting and conveying material by iron cable. W. D. Andrews & Bro. 414 Water st. N. Y.

Parties needing estimates for Machinery of any kind, call on, or address, W. L. Chase & Co., 93, 95 97 Liberty Street, New York.

Steam Fire Engines, R. J. Gould, Newark, N.J.

For Solid Emery Wheels and Machinery, send to the Union Stone Co. Boston, Mass., for circular.

For best Presses, Dies and Fruit Can Tools Bliss & Williams, cor. of Plymouth & Jay, Brooklyn, N.Y

Engines 2 to 8 H.P. N. Twiss, New Haven, Ct.

Protect your Buildings—Send for testimonials. N. Y. State Roofing Co., 6 Cedar St., N. Y.

All Fruit-can Tools, Ferracute, Bridgeton, N.J.

Lathes, Planers, Drills, Milling and Index Machines. Geo. S. Lincoln & Co., Hartford, Conn.

For Solid Wrought-iron Beams, etc., see advertisement. Address Union Iron Mills, Pittsburgh, Pa., for lithograph, etc.

Temples and Oilcans. Draper, Hopedale, Mass.

Hydraulic Presses and Jacks, new and second hand. E. Lyon, 470 Grand Street, New York.

Peck's Patent Drop Press. For circulars, address Milo. Peck & Co., New Haven, Conn.

Small Tools and Gear Wheels for Models. List free. Goodnow & Wightman, 23 Cornhill, Boston, Ms.

W. W. S. can improve his bottled beer by following the directions on p. 107, vol. 29.—W. G. P. will find directions for bronzing malleable iron castings on p. 208, vol. 30.—W. P. can remove writing ink from postage stamps by the process described on p. 386, vol. 26.—H. S. can make an æolian harp by following the directions on p. 330, vol. 26.—J. B. R. & Co. will find a recipe for Babbitt metal on p. 122, vol. 28.—H. W. C. will find directions for making transfer or impression paper on this page.—P. M. will find that marine glue, as described on p. 202, vol. 28, will answer his requirements. The *papiermache* decorations are described on p. 16, vol. 27.—A. J. C. will find descriptions of solder for all purposes on p. 251, vol. 28.—A. N. can make a silver wash by the process detailed on p. 299, vol. 28.—H. C. S.'s query doubtless relates to the method of Dr. De la Perouse, fully described on p. 119, vol. 30.—L. C. will find a good recipe for paste on p. 280, vol. 28.—M. E. will find the required information in "*Perpetuum Mobile*," in two series, by Henry Dircks, C. E.

R. G. asks: "To one gallon of gasoline, add one tablespoonful of salt, one tablespoonful sal soda, pounded fine, and a piece of alkanet root one inch long." Is this a recipe for a safe oil? A. These bodies do not diminish the danger of burning very light and cheap oils in kerosene lamps, and fatal accidents happen every day from persons being deceived by such statements.

L. D. C. asks: Which is the best treatise on geology? A. Lyell's "Manual of Geology." Read also, if you have a chance, Hugh Miller's works.

H. W. C. asks: Will you give me a recipe for black printers' ink? A. Take pure balsam copaiba 9 ozs., lamp black 3 ozs., indigo and Prussian blue, each ½ oz., Indian red ¾ oz., dry yellow soap 3 ozs.; grind to smoothness with a muller on a stone.

J. W. R. asks: How can I make a paste that will stick paper firmly to new bright tin? A. Mix a tablespoonful or two of brown sugar with each quart of flour paste.

T. asks: Where can I procure a work on steam heating? A. Box on "Heat" is a standard authority. See our advertising columns for booksellers' addresses.

J. J. asks: 1. What will make glue remain soft and elastic after it is dried on cloth? A. The solution of caoutchouc described on p. 251, vol. 29, will perhaps serve your purpose. 2. How is emery stuck to emery cloth? A. The best glue is used.

W. G. P. asks: How can I dye small pieces of wood green? A. Try crystals of verdigris dissolved in water.

S. asks: Can you give me a recipe for making an imitation of rosewood without the use of nitric acid? A. Dissolve 4 ozs. potash in 1 gallon hot water, and 4 ozs. red sanders wood; when the color of the wood is extracted, 2½ lbs. gum shellac are added and dissolved over a quick fire. Use this on a groundwork stained with logwood.

R. H. asks: 1. How are red and green fires made? A. Red light is a mixture of nitrate of strontia, sulphur, and chlorate of potash. Green light is a mixture of carbonate of baryta with sulphur and chlorate of potash. 2. Of what does the smoke, resulting from burning these fires, consist? A. The smoke is a mixture of the sulphides of barium, strontium, and potassium, with sulphuretted hydrogen, sulphurous acid, hyponitric acid, carbonic acid, hypochloric and chlorous acids, and the chlorides of sulphur and potassium. All these bodies would be unpleasant and some very injurious to breathe. 3. A young man burnt his hand by igniting these; what is his best remedy? A. The burned hands should have been wrapped in strips of soft linen or muslin, which were covered over with a mixture of equal parts of linseed and sweet oil.

G. S. T. asks: 1. What is the most simple form of anemometer? A. A good one is described on p. 246, vol. 26, and another on p. 283, vol. 29. 2. Where can I find a description of Professor Coffin's card anemometer, referred to in his memoir on p. 82, vol. 30? A. Address Lafayette College, Easton, Pa.

G. S. asks: How can I obtain the frosted appearance upon silver ware commonly called oriental finish? It is done with some kind of acid. A. Your best mode will be to experiment with muriatic, nitric, and other acids until you get the desired results. 2. What ingredients are used as a paint for fancy gilding? A. The metal may be gilt by using a solution made by dissolving as much gold in *aqua regia* as it will take up. Fine linen rags are soaked in this solution, carefully dried, and afterwards burnt to tinder. The substance to be gilt must be well polished; a piece of cork is first dipped into a solution of common salt in water, and afterwards into the tinder, which is well rubbed on the metal to be gilt, and the gold appears with its proper luster.

C. R. asks: How can I make fumigating pastils? A. Take ¼ lb benzoin, ¼ lb. cascarilla, 1¼ ozs. myrrh, 1½ lbs. charcoal, ¾ oz. otto of nutmegs, ¾ ozs. otto of cloves. Powder the first four and mix by sifting. Add the ottos, and also 2 ozs. of niter which has been previously dissolved in tragacanth mucilage. After well beating in a mortar, the pastils are formed into shape in a mold, and gradually dried.

A. M. T. says: 1. I have constructed the telescope described on p. 7, vol. 30, and I have had perfect satisfaction so far in seeing the mountains and craters of the moon, which were visible very plainly. I have been trying to look at the sun, but by its brilliancy it is impossible to do so without different arrangements. How can I look at the sun with the above named telescope? A. Put as many pieces of red glass between the eyepiece and the eye as will enable you to look at the sun without being dazzled. 2. How and in what part of the heavens can I find the planets? A. The *Nautical Almanac* gives the position for every day and hour during the year. See our Astronomical Notes, published monthly. 3, Where can I find the nebulæ? A. Their position is marked in any map of the heavens.

M. W. M.—A preliminary examination would be necessary to ascertain the novelty of your piston packing. See our advertisement in this issue.

C. T. S.—Such a trap could be constructed, but it would be complicated and expensive.

J. W. B. asks: Does pure hydrant or other non-stagnant water contain animalculæ? If so, what power of microscope is required for detecting them? A. Pure hydrant water should not contain animalculæ. 2. I have tried the recipe on page 351, vol. 24, for kalsomining, which covers and adheres well, but has no glaze. It is over a rough whitewashed wall, and the stains from the soot of the chimney show through. What can I do to cover them, and to give the kalsomine a glazed appearance? A. Kalsomine has no glaze. It should have been so mixed that it would have been thin enough to work well, without being too thin to cover. In answer to your other question: No.

C. E. W. says: We have recently introduced a new system for making gas from petroleum; and for safety's sake, we use only oils that have all volatile gases, such as naphtha, rhigoline, benzine, etc., driven off by heat or otherwise. The only objectionable feature in this new gas is that it smokes; and although, by reducing the burners to a minimum, we have improved it, we have not entirely overcome the difficulty. We use now ½ foot, ¾ foot, and 1 foot burners only. We are using hardly any pressure. What is the cause of the gas smoking, and how could it be obviated? Why do fish tail burners make it smoke worse? A. These oils are highly carbonized, and require a large supply of air for their perfect combustion. In a fishtail burner, the gas at the moment of combustion is in contact with the air only on the outside of the flame. You must use some form of argand burner, which will admit air to the interior of the flame.

E. B. S., F. C. R., F. E. P., A. F. S. C. H. J., C. J. K., N. L. F., C. E. M., J. B. T., J. G. M., J. W. P., and F. G. H. have sent correct answers to the ship and cannon question. F. G. P. does not clearly understand the query.

W. J. S. asks: Is the Walter printing press used in this country? A. The Walter press is in use in the New York Daily *Times* establishment here.

M. asks: 1. I have a plunger pump attached to the crosshead of my engine, which runs at 120 revolutions per minute. This pump has the full stroke of engine. The delivery pipe and suction pipe are of the same size; and when the engine runs fast, the check valve thumps dreadfully. I cannot use the pump when she is running fast; but when running slow, it works very well. There is an air chamber on the delivery valve. Now I wish you would tell me what is the cause of this. I think that, when running fast, the plunger leaves the water. A. Probably the plunger runs faster than the water can flow into the pump. 2. What do you call wire-drawing steam? A. Reducing the pressure, by allowing the steam to expand without performing work. 3. Does it make any difference in leading the steam to a gage, whether the pipe is the same size all along? A. No. 4. What does "Fahrenheit" mean? Is it the name of the man who first invented the thermometer? A. It refers to the thermometric scale graduated by Fahrenheit. The thermometer was not invented by Fahrenheit, but he first made mercurial thermometers. 5. What is the greatest perpendicular higat to which a double acting pump will lift water? A. From 30 to 32 feet.

L. D. S. asks: 1. Are there any rules for finding the distance and vanishing points when drawing from Nature? An English work says there are none. A. No. None are needed. To sketch from Nature, one must learn to see correctly, and this must be acquired by practice. In drawing ideal pictures, the distance and vanishing points are located according to the judgment of the artist, so as to produce the best effect. 2. Who publishes the best book of instruction on pencil and india ink drawings? A. We know of none that we can recommend. Many are published, however. We do not believe that free hand drawing can be learned from books. 3. What kinds of paint are used for painting pictures on the glass slides used in magic lanterns? A. See p. 123, vol. 30.

C. asks: What sized boilers shall I require to give me steam enough to do the following work: To keep 6 drying chambers, 30 feet in depth, with end and one side wall of stone, divided off by frame partitions every 4 feet, and with total front of 36 feet, heated by one inch coil steam pipe at a temperature of 156° Fah. night and day. To supply steam at 60 lbs. pressure to run a 12x20 engine for 6 hours per day. To supply steam sufficient to keep 18,000 gallons water at 80° day and night in winter, in the latitude of St. Louis, Mo. A. Professional question. Should be submitted to an engineer.

T. C. H. asks: How can I make transfer paper, to copy a drawing by tracing with a steel point? A. Make a stiff paste of lard and plumbago, and smear over the paper with a piece of rag.

E. H. B. asks: Why does pork, when it is killed in the wane of the moon, shrink from the bone when boiled? A. It does nothing of the kind.

W. T. Mc.L asks: Who was the scientist Nuttall? He seems to have been one of our most thorough naturalists in botany and ornithology. A. An English naturalist who resided for some years in this country. He explored nearly all the States of the Union; and was, from 1822 to 1834, Professor of Natural History at Harvard. He died in England in 1859.

A. R. G. asks: Would a turbine gain any power by having two spiral flanges or buckets run up the shaft to the top of the penstock? A. No. There is a certain proportion of the hight of the penstock to which the spiral flanges can be extended with economy. But putting such flanges all the way up only distributes the power due to the head of water.

W. G. B. asks: When patent claims are separable, or can be used in some other combination even if it be for the same purpose, is not inserting them the same thing as trying to get several patents by merely paying for one? In reality, is not the combination the only thing patented? A. The patent relates to one invention only, and all claims that relate to another must be put in a separate application.

W. A. M. H. asks: How can I make corn starch? A. In making starch, the corn, wheat, or other grain is steeped in water for some days till the saccharine portion ferments and the starch granules become free from glutinous matter. The sour liquor is then drawn off, and the feculous residue washed on a sieve; what passes through is allowed to settle, the liquid again drawn off, and the starch washed from the slimy water. It is then drained in perforated boxes, and dried by exposure to the heat or to the air. In treating corn, about 200 grains of alkali, in the form of caustic soda, are added to each gallon of liquid to facilitate the separation of the gluten and other nitrogenous matter.

F. C. asks: Is there a chemical compound which, applied to paper, will be decomposed by an electric current passing on a wire in contact with it, so as to leave a permanent mark? A. Yes. Prussiate of potash.

G. P. H. asks: How many feet of gas does one burner burn in one hour? A. It depends on the size of the orifice of the burner. The larger the orifice, the more gas escapes. Street gas burners are generally bored to burn three feet of gas per hour. Five feet burners are often used in dwellings and churches.

W. W. H. asks: Is there any danger of injuring the enamel on one's teeth by cleaning with an ordinary brush and water twice a day? A. No. The danger is that, if the cleaning be neglected, not only the enamel but the entire substance of the teeth will sooner or later become injured and decay.

M. C. M. asks: 1. How can I find the contents of a cylindrical vessel or drum that shall be equal to the contents of a rectangular cistern, and also the contents of a cistern that shall be equal to the contents of a cylinder? A. Find the area of the base of the cylindrical vessel, and divide the contents of the box by that area. The quotient will be the hight. Or if the hight is given, divide the contents of the box by that, and the quotient will be the area of the base. 2. Does a caveat for a patent have to undergo the same examination as an application for a patent? A. No examination is required in filing a caveat. In applying for a patent afterwards, the same regulations must be complied with as if you had not taken out a caveat.

G. C. H. asks: How can I construct a simple, cheap, and efficient electrical battery for the cure of disease? A. The magneto-electric machine is the one generally used for the administration of electricity in disease. By this instrument a rapid succession of shocks, the intensity of which can be graduated, are given, either to the whole body or to the particular part affected. In this machine either a permanent magnet, or an electromagnet, for which a battery must be used, is employed to generate a secondary current in a long coil of fine wire. Consult some good physician as to the best form of apparatus.

G. T. P. asks: How can I make a leather cement? A. Dissolve 1 part caoutchouc in 3 parts chloroform.

H. E. R. asks: 1. What solution is used in plating with nickel, and how can I make it? A. The nickel salt used in plating is the double sulphate of nickel and ammonia. It will probably save you time, trouble, and expense to purchase this salt already made from the manufacturers who supply the nickel platers in New York. 2. Is there any substance which, if added to the solution, will cause the plating to appear bright, or will it have to appear burnished? A. You can polish the ware after plating.

P. D. asks: 1. What is the quantity of cyanide of potassium required to precipitate 5 pennyweights gold from the nitro-muriatic solution? If too much cyanide be used, how can I recover the gold that has been dissolved by cyanide in the acid solution? A. About 1 pennyweight 16 grains. You cannot dissolve the cyanide of gold by cyanide of potassium in the acid solution. 2. What are the proportions used to make a gold solution (about 1 quart) so as to get a good yellow, bright color on chains? A. Agitate ether with a solution of perchloride of gold for some time, allow it to repose, and decant the supernatant portion. 3. What is the chemical name for what is generally called the B. Bray tallow? A. The name you mention is probably a trade mark or brand of some kind of tallow. 4. How can I braze thin sheets of copper and brass for cooking utensils, and what is the best spelter to use, and how is it made? A. The edges after being filed or scraped quite clean are covered with a mixture of hard solder and powdered borax made into a paste with water. The whole is then allowed to dry, and afterwards exposed in a clear fire to heat sufficiently to melt the solder. Spelter is the commercial name for zinc. For hard solder, apply to the plumber.

A. B. asks: 1. What ingredients are used in the manufacture of Pharoah's serpents' eggs? A. Pharoah's serpents are said to consist principally of the sulphocyanide of mercury, which we would not advise you to attempt to make, but to apply to a chemist, and then to be careful in using. 2. What will remove superfluous hair from the head and not injure the skin and remaining hair? A. There are numerous depilatories or hair removers. We do not advise you to use them, as they are more of less injurious to health. 3. How can I separate alcohol from home made grape wine without injuring it for drinking purposes? A. If you distil your home made wine, you will drive off most of the alcohol, obtaining a kind of brandy, and only water will be left behind. 4. How can I make gold and silver ink, to be of use? A. Gold or silver in very fine powder is ground up with a little gum water. A cheap gold ink is made with what is called mosaic gold, the bisulphuret of tin.

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E. R. McC. asks: Can a patent be attached or a debt of the inventor? A. No. An injunction might be granted in a proper case, preventing its transfer except to a receiver appointed by the court.

C. R. M. says: Kainit, as suually sold, consists of 28 to 30 per cent of sulphate of potassa, 14 to 16 per cent sulphate of magnesia, 4 to 5 per cent chloride of magnesia, 35 to 40 per cent chloride of sodium, and 10 to 12 per cent sulphate of lime. I want to use it as a substitute for ashes (which I cannot get), as a manure for onions. What is its probable efficacy? The potash and salt are good, but is the sulphate of magnesia likely to be injurious? A. The large proportion of potash in kainit should render it superior to ashes as a fertilizing agent, and we do not believe that the other salts will materially affect it in this respect.

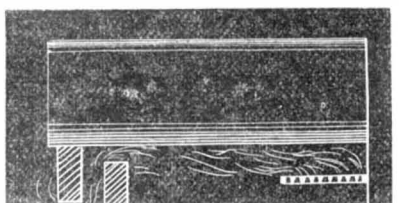
H. A. S. says: 1. On page 27, current volume, in your answer to M. W. H., you say that 9,000 feet per minute is recommended as the proper speed for the rims of circular saws of all sizes. I think that, other things being equal, the speed of the rim should be in proportion to the power. I should figure the speed of the little foot power saw by compound proportion, thus: If a saw with teeth one inch apart, running with six horse power, cutting nine inch lumber, requires a speed of 9,000 feet per minute, what should be the speed of a saw with teeth half an inch apart, cutting one inch lumber and running with one eighth horse power?

6 : ½ } 1 : 9 } :: 9,000 : 843+. I do not say 843 feet per minute is 1 : ⅛ }

just the right speed for a foot power saw, but I think it would be correct if 9,000 is just right for the supposed six horse power saw. The smaller saw might, however, be made to saw smoothly by running at a higher speed, but I think only by a loss in the amount of work done. I think the reason that your correspondent's saw did less work at the nigher speed was that more power was required to cut the sawdust finer, and more was lost in economizing friction. A. Your theory does not agree with the results obtained by experiment. 2. Not long since I heard a man say that kerosene oil would destroy the temper of steel. Is it true? As the temper depends on the internal structure of the steel, and the oil can reach only the surface, I do not see why the temper should be injured throughout. A. You are right. 3. At what speed should a power drill run? A. In wrought iron, the speed of the drill should be about 12 feet a minute.

R. C. says, in reply to S. G. F., who asked about filtering water: If he can dig a trench, parallel with the stream, arrange a filtering gallery and filter the water through the bottom of his gallery, perhaps it would help him out and give no further trouble.

W. S. D. says, in reply to J. M., who asked if a check wall under the back end of a steam boiler will save fuel: Build a bridge wall just 1 foot forward



of the back end of the boiler, up to 4 inches from the bottom of the boiler, and then another wall just at the end of the boiler upon an iron bar hung on the side walls, to hang down 8 or 10 inches below the top of the bridge wall. Let the second wall come close up to the boiler. You will save fuel each day enough to pay you for your trouble and expense, and not a spark will escape into the smoke stack.

G. S D. says, in reply to A. M., who asked how to find the weight of a person's head without cutting it off: Attach to the person, as high up as convenient, an ordinary rubber bag or life preserver with tube and stop cock. Immerse the apparatus in water, and force air into the bag until the head is entirely above the surface. Secure the bag of air in any suitable vessel, fill with water, and weigh. Let out the air, again fill the vessel with water, and weigh. The difference between these two weights will equal the weight of the head.

T. V. says, in reply to T. J. McM.'s question: How can I divide a line into two parts so that the square of one of the parts may be double the square of the other? Let A B be the given line. Draw A C, making ¼ of a right angle with A B, and draw B C, making ¼ right angle with same line; at the angle C, draw C D a tright angles to C B. Then the square on D B is double that on A D.

E. B. W. says, in reply to the question: What would become of a body dropped into a hole passing through the earth's center? This question has been much discussed, and the following opinions given: 1. By the prodigious momentum acquired in falling, the body would pass out at the opposite side into space. 2. That it would move to the opposite surface, return to the starting point, and vibrate for ever from side to side. 3. That these vibrations would lessen and the body finally rest at the center. I hold that none of these opinions are correct, but that the body would fall to the center and not pass it. What of its momentum? asks some one. In general, the momentum or inertia of a moving body is represented by the product of its velocity and weight, and may be formulated thus: $m=v\times w$. When the body reaches the center of gravity, being attracted equally in all directions, it has no weight; and the formula becomes $m=v\times 0=0$. That is, the momentum of a falling body ceases at the center of gravity. Nothing then remains to cause it to pass that point. Will some mathematician calculate the culminating points of the velocity and momentum in the descent of a falling body? I opine the former is much nearer the center than the latter.

M. J. M. says, in reply to R. T. and others who asked for a recipe for wood filling: Take 3 lbs. corn starch or silver white, 1 lb. pulverized pumicestone, ½ pint boiled oil; add Japan varnish enough to dry the oil, and turpentine to make it the consistency of thin paint; apply with a brush, then let it stand until it begins to turn white, then commence rubbing with a cotton cloth, always in a circle and against the grain of the wood. For cleaning the filling out of carving, make a brush of hair cloth by removing the thread from the hair, leaving the hair about an inch long; roll it tight and fasten with tacks. Set the wood aside for one day to dry. After it has become dry take seven parts of boiled oil, one part of naphtha, and oil the work with it clean with cotton cloth. You will find that the wood will be very white before applying the oil, but the oil will restore it to its original color.

MINERALS, ETC.—Specimens have been received from the following correspondents, and examined with the results stated:

G. L. E.—Your specimen consists of dark colored tourmaline in quartz. Tourmaline is a silicate of alumina, containing also oxide of iron and potash.

N. M.—These specimens are iron pyrites, and are of little value at the present time.

A.—The mineral sent is graphite or plumbago: which, you know, is composed of carbon. The specimen shows traces of iron.

COMMUNICATIONS RECEIVED.

The Editor of the SCIENTIFIC AMERICAN acknowledges, with much pleasure, the receipt of original papers and contributions upon the following subjects:

On Death Statistics. By S. B.

On Ventilation. By S. W. and by W. S Jr.

On the Art of Tanning. By D. S.

On the Duration of Brain Impressions and the Memory. By D. S. T.

On the Use of Petroleum in Steam Boilers. By J. B. W.

On Canal Navigation in Winter. By C. P.

On the Cow Milk Tree. By C. L.

Also enquiries from the following:

H. W.—N. T. W.—C. A. M.—F. L. R.—J. H.

Correspondents in different parts of the country ask: Who makes ditching plows, to be drawn by horse power? Who furnishes small castings of a low grade of steel? Where can infusorial silica be obtained in large quantities? Who makes feed water heaters? Who makes electric gas lighters? Who constructs boilers which will not explode when the water gets low? Where is a boring machine, suitable for hubs for setting boxes, sold? Where can asbestos be obtained? Makers of the above articles will probably promote their interests by advertising, in reply, in the SCIENTIFIC AMERICAN.

Correspondents who write to ask the address of certain manufacturers, or where specified articles are to be had, also those having goods for sale, or who want to find partners, should send with their communications an amount sufficient to cover the cost of publication under the head of "Business and Personal," which is specially devoted to such enquiries.

[OFFICIAL.]

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AND EACH BEARING THAT DATE.

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APPLICATIONS FOR EXTENSIONS.

Applications have been duly filed, and are now pending for the extension of the following Letters Patent. Hearings upon the respective applications are appointed for the days hereinafter mentioned:

28,108.—LEATHER FINISHING MACHINE.—W. P. Martin. April 15.
28,139.—SEWING MACHINE.—G. B. Arnold. April 22.
28,174.—PICTURE HANGING MOLDING.—H. Hochstrasser. April 22.
28,181.—BURNISHING BOOT SOLES.—E. T. Ingalls. April 22.
28,184.—CEMENT PIPE MOLD.—H. Knight. April 22.
28,189.—SUGAR DRYING MACHINE.—A. W. J. Mason. Ap. 22.
28,198.—CULTIVATOR TEETH.—D. B. Rogers. April 22.
28,244.—RUFFLE.—G. B. Arnold. April 22.
28,314.—WATER WHEEL.—A. M. Swain. April 29.
28,470.—SLIVER MACHINE.—F. T. Grant. May 13.

EXTENSIONS GRANTED.

27,034.—HARVESTER.—J. Butter.
27,043.—UMBRELLA STAND LOCK.—A. M. Foote.
27,065.—COFFEE MILL.—J. & E. Parker.

DESIGNS PATENTED.

7,148.—SHIELD.—G. W. Dauth, Reading, Pa.
7,149.—SIRUP CUP PLATE.—J. Jepson, West Meriden, Ct
7,150.—SLEIGH.—F. D. Kennedy, Albany, N. Y.
7,151.—SLEIGH.—J. Lodewick, Troy, N. Y.
7,152.—COMB.—W. Pauly, College Point, N. Y.
7,153.—BRACKET.—J. B. Sargent, New Haven, Conn.
7,154.—TYPE.—R. Smith, Philadelphia, Pa.
7,155 & 7,156.—CARPETS.—T. J. Stearns, Boston, Mass.
7,157.—LABELS.—S. Ward, Boston, Mass.

TRADE MARKS REGISTERED.

1,611.—CIGARS.—J. H. Battis, Salem, Mass.
1,612.—OILS.—J. A. Bostwick & Co., New York city.
1,613.—SMOKED MEATS.—J. Grubb & Co., Cincinnati, O.
1,614.—PRINTED PUBLICATION.—J. Gruber, Hagerstown, Md.
1,615 & 1,616.—IRISH LINENS.—Paton & Co., N. Y. city.
1,617.—PLASTER.—J. McI. Smith, New York city.
1,618.—FLOUR.—J. Stabler, Baltimore, Md.
1,619.—BISCUIT.—Thurston & Co., Cambridgeport, Mass.
1,620.—SAWS.—The Wheeler & Co. Manufacturing Company, Middletown, N. Y.

SCHEDULE OF PATENT FEES.

On each Caveat $10
On each Trade Mark $25
On filing each application for a Patent (17 years). $15
On issuing each original Patent $20
On appeal to Examiners-in-Chief $10
On appeal to Commissioner of Patents $20
On application for Reissue $30
On application for Extension of Patent $50
On granting the Extension $50
On filing a Disclaimer $10
On an application for Design (3½ years) $10
On application for Design (7 years) $15
On application for Design (14 years) $30

[Specially reported for the Scientific American.]

CANADIAN PATENTS.

LIST OF PATENTS GRANTED IN CANADA, FEBRUARY 11, 1874.

3,095.—J. P. Manton, G. H. Remington and B. D. Thayer Providence, R. I., U. S. Improvements on ship's windlasses, called "Improved Pump Brake Windlasses for Vessels." Feb. 11, 1874.
3,096.—H. Hills, G. W. Mills and Wm. Mc. Lockwood, Highland, Oakland county, Mich., U. S. Improvements on pruning shears, called "Hill's Pruning Shears." Feb. 11, 1874.
3,097.—F. W. Rhinelander, N. Y., U. S. Improvements on boot and shoe tips, called "Rhinelander's Enameled Shoe Tip." Feb. 11, 1874.
3,098.—W. H. Lunt, Cambridge, Mass, U. S. Improvement in filters, called "The Lunt Filter." Feb. 11, 1874.

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3,099.—E. Smart, Brockville, Leeds county, Ontario. Improvements on oil gates, called "Smart's Improved Molasses and Oil Gate." Feb. 11, 1874.

3,100.—E. P. Hannaford, Montreal, P. Q. Improvements on a signal lamp, called "Hannaford's Stationary Signal Lamp." Feb. 11, 1874.

3,101.—H. A. Holmes. Epsom, Merrimack county, N. H., U. S. Improvement on machines for sawing clap boards, called "Holmes' Clapboard Machine. Feb. 11, 1874.

3,102.—Wm. Fuller, Montreal, P. Q. Composition of plastic material, called "Fuller's Plastic Compound." Feb. 11, 1874.

3,103.—Wm. X. Stevens, Brookfield, Worcester county, Mass., U. S. Improvements on shears for cutting bars and rods of iron or other metal or material, "called "Stevens' Improved Bar Shears." Feb. 11, 1874.

3,104.—C. E. Blake, San Francisco, San Francisco county, Cal., U. S. Improvements on dentistry, the same consisting in a means of disguising the bright color of gold filling for teeth, whereby said filling is also rendered more durable, and also of an improved metallic foil for dental purposes, called "Blake's Improved Filling for Teeth." Feb. 11, 1874.

3,105.—G. J. Wilson, Ottawa, Ontario. Improvement on a machine for drying clothes, called "Wilson's Eureka Clothes Rack." Feb. 11, 1874.

3,106.—G. Young, Oshawa, Ontario county, Ontario. Improvements on shuttles for sewing machines, called "Young's Improved Shuttle." Feb. 11, 1874.

3,107.—F. Culham, Widder Station, Bosanquet, Lambton county, Ontario. Improvements on nut fasteners of railroad rails, called "Culham's Patent Nut Fastener of Railroad Rails." Feb. 11, 1874.

3,108.—P. Munsinger, Mitchell, Perth county, Ontario. Improvements on pumps, called "Munsinger's Improved Pump." Feb. 11, 1874.

3,109.—W. H. Cutler, Buffalo, Erie county, N. Y., U. S. Improvements in portable inhaling tubes, called "Cutler's Inhaling Tube." Feb. 11, 1874.

3,110.—R. B. Tait, Oakville, Halton county, Ontario. Improvements in car couplings, called "Tait's Improved Car Coupler." Feb. 11, 1874.

3,111.—H. McKenzie, Marquette, Marquette county, Mich., U. S. Improvements on apparatus for leaching, called "McKenzie's Perpetual Leach." Feb. 11. 1874.

3,112.—A. Halon, Quebec. *Une cheminee portative*, called "*Cheminee Portative.*" A portable chimney. Feb. 11, 1874.

3,113.—A. Anderson, London, Middlesex county, Ontario. Improvements on coupling for railroad cars, called "Anderson's Safety Railroad Coupling and Buffer Combined." Feb. 11, 1874.

HOW TO OBTAIN
Patents and Caveats
IN CANADA.

PATENTS are now granted to inventors in Canada, without distinction as to the nationality of the applicant. The proceedings to obtain patents in Canada are nearly the same as in the United States. The applicant is required to furnish a model, with specification and drawings in duplicate. It is also necessary for him to sign and make affidavit to the originality of the invention.

The total expense, in ordinary cases, to apply for a Canadian patent, is $75, U. S. currency. This includes the government fees for the first five years, and also our (Munn & Co.'s) charges for preparing drawings, specifications and papers, and attending to the entire business. The holder of the patent is entitled to two extensions of the patent, each for five years, making fifteen years in all.

If the inventor assigns the patent, the assignee enjoys all the rights of the inventor.

A small working model must be furnished, made to any convenient scale. The dimensions of the model should not exceed twelve inches.

If the invention consists of a composition of matter, samples of the composition, and also of the several ingredients, must be furnished.

Persons who desire to apply for patents in Canada are requested to send to us (MUNN & Co.), by express, a model with a description, in their own language, showing the merits and operation of the invention, remitting also the fees as above for such term for the patent as they may elect. We will then immediately prepare the drawings and specification, and send the latter to the applicant for his examination, signature, and affidavit. It requires from four to twelve weeks' time, after completion of the papers, to obtain the decision of the Canadian Patent Office. Remit the fees by check, draft, or Postal order. Do not send the money in the box with model. Give us your name in full, middle name included

Inventions that have already been patented in the United States for not more than one year may also be patented in Canada.

On filing an application for a Canadian patent, the Commissioner causes an examination as to the novelty and utility of the invention. If found lacking in either of these particulars, the application will be rejected, in which case no portion of the fees paid will be returned to the applicant.

Inventors may temporarily secure their improvements in Canada by filing *caveats;* expense thereof, $35 in full.

For further information about Canadian patents, assignments, etc., address

MUNN & CO.,
37 Park Row,
New York.

VALUE OF PATENTS,
And How to Obtain Them.
Practical Hints to Inventors.

PROBABLY no investment of a small sum of money brings a greater return than the expense incurred in obtaining a patent, even when the invention is but a small one. Large inventions are found to pay correspondingly well. The names of Blanchard, Morse, Bigelow, Colt, Ericsson, Howe, McCormick, Hoe, and others, who have amassed immense fortunes from their inventions, are well known. And there are thousands of others who have realized large sums from their patents.

More than FIFTY THOUSAND inventors have availed themselves of the services of MUNN & Co. during the TWENTY-SIX years they have acted as solicitors and Publishers of the SCIENTIFIC AMERICAN. They stand at the head in this class of business; and their large corps of assistants, mostly selected from the ranks of the Patent Office: men capable of rendering the best service to the inventor, from the experience practically obtained while examiners in the Patent Office: enables MUNN & Co. to do everything appertaining to patents BETTER and CHEAPER than any other reliable agency.

HOW TO OBTAIN PATENTS

This is the closing inquiry in nearly every letter, describing some invention which comes to this office. A *positive* answer can only be had by presenting a complete application for a patent to the Commissioner of Patents. An application consists of a Model, Drawings, Petition, Oath, and full Specification. Various official rules and formalities must also be observed. The efforts of the inventor to do all this business himself are generally without success. After great perplexity and delay, he is usually glad to seek the aid of persons experienced in patent business, and have all the work done over again. The best plan is to solicit proper advice at the beginning. If the parties consulted are honorable men, the inventor may safely confide his ideas to them; they will advise whether the improvement is probably patentable, and will give him all the directions needful to protect his rights.

To Make an Application for a Patent.

The applicant for a patent should furnish a model of his invention if susceptible of one, although sometimes it may be dispensed with; or, if the invention be a chemical production, he must furnish samples of the ingredients of which his composition consists. These should be securely packed, the inventor's name marked on them and sent by express, prepaid. Small models, from a distance, can often be sent cheaper by mail. The safest way to remit money is by a draft or postal order, on New York, payable to the order of MUNN & Co. Persons who live in remote parts of the country can usually purchase drafts from their merchants on their New York correspondents.

How Can I Best Secure My Invention?

This is an inquiry which one inventor naturally asks another, who has had some experience in obtaining patents. His answer generally is as follows, and correct:

Construct a neat model, not over a foot in any dimension—smaller if possible—and send by express, prepaid, addressed to MUNN & Co., 37 Park Row, together with a description of its operation and merits. On receipt thereof, they will examine the invention carefully, and advise you as to its patentability, free of charge. Or, if you have not time, or the means at hand, to construct a model, make as good a pen and ink sketch of the improvement as possible and send by mail. An answer as to the prospect of a patent will be received, usually, by return of mail. It is sometimes best to have a search made at the Patent Office; such a measure often saves the cost of an application for a patent.

Preliminary Examination.

In order to have such search, make out a written description of the invention, in your own words, and a pencil, or pen and ink, sketch. Send these, with the fee of $5, by mail, addressed to MUNN & Co., 37 Park Row, and in due time you will receive an acknowledgment thereof, followed by a written report in regard to the patentability of your improvement. This special search is made with great care, among the models and patents at Washington, to ascertain whether the improvement presented is patentable.

Foreign Patents.

The population of Great Britain is 31,000,000; of France, 37,000,000; Belgium, 5,000,000; Austria, 36,000,000; Prussia, 40,000,000, and Russia, 70,000,000. Patents may be secured by American citizens in all of these countries. Now is the time, when business is dull at home, to take advantage of these immense foreign fields. Mechanical improvements of all kinds are always in demand in Europe. There will never be a better time than the present to take patents abroad. We have reliable business connections with the principal capitals of Europe. A large share of all the patents secured in foreign countries by Americans are obtained through our Agency. Address MUNN & Co., 37 Park Row, New York. Circulars with full information on foreign patents, furnished free.

Trademarks.

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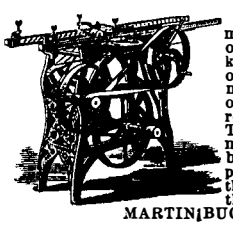

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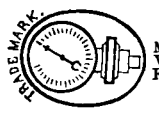

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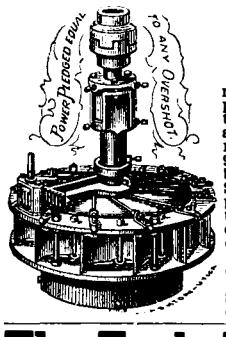

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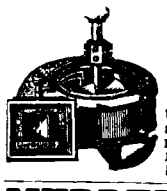

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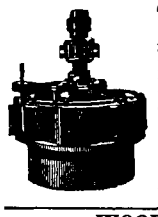

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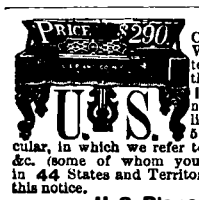

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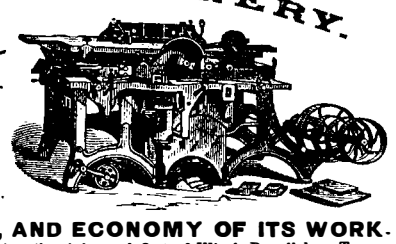

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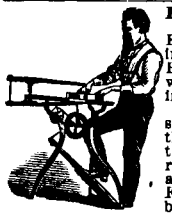

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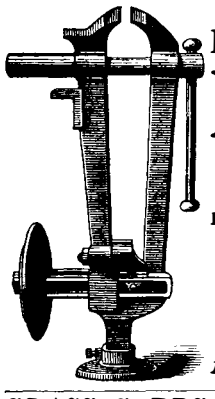

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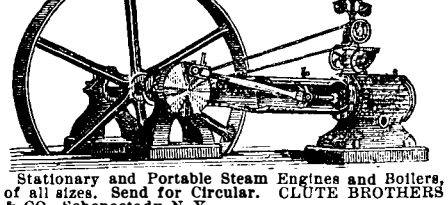

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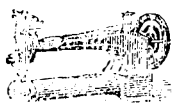

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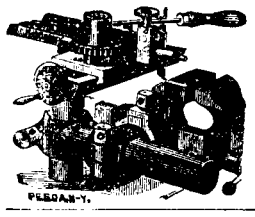

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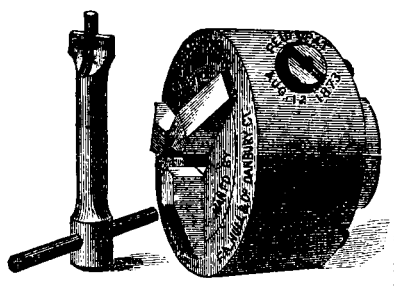

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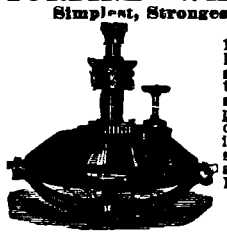

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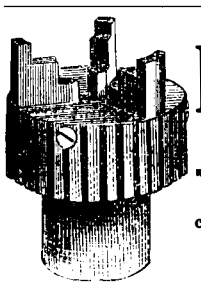

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